

MORBIDITY &
MORTALITY:
2002 CHART BOOK
ON CARDIOVASCULAR,
LUNG, AND BLOOD
DISEASES

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FOR ADMINISTRATIVE USE

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and Blood Institute*

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Foreword

The mission of the National Heart, Lung, and Blood Institute (NHLBI) is to provide leadership and support for research in cardiovascular, lung, and blood diseases; sleep disorders; women's health; and blood resources. The ultimate goal is to improve the health and well-being of the American people. Although program priorities are determined primarily by research opportunities, other factors have an influence: the magnitude, distribution, and trends of cardiovascular, lung, and blood diseases in the United States, as well as the ability to improve the Nation's health; congressional mandates; the health needs of the Nation as perceived by Institute staff and outside advisory groups; and recommendations from the National Heart, Lung, and Blood Advisory Council, have a significant impact on establishing research priorities.

Evaluation of the Institute's program balance and program impact is a continuous process that relies on assessments of morbidity and mortality in the United States from cardiovascular, lung, and blood diseases. Consideration is given to their distribution among the population; to their trends over time; and to related statistics on population risk factors, lifestyles, medical care, and economic impact.

This *Chart Book*, like its predecessors, provides information on the progress being made in the fight against cardiovascular, lung, and blood diseases. It serves as a resource for the Institute as it plans and prioritizes future activities.

I would like to express my appreciation to Mr. Thomas Thom of the NHLBI for his time and effort in developing the material presented in this *Chart Book*.

Claude Lenfant, M.D.
Director
National Heart, Lung, and Blood Institute

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1. Introduction

During the past 35 years, major advances have been made in the prevention, diagnosis, and treatment of cardiovascular, lung, and blood diseases. Death rates from cardiovascular diseases (CVD) have declined significantly and Americans are living longer, healthier lives. Yet, despite the tremendous progress that has been made, morbidity and mortality from cardiovascular, lung, and blood diseases contribute to the immense burden on patients, their families, and the national health care system; the economic cost to the Nation is substantial.

This *Chart Book* describes the magnitude of the problem and provides time trends for these diseases, highlighting demographic differences—age, sex, and minority/ethnic status. Data are presented by race and ethnicity to the extent they are available, statistically reliable, and consistently collected within a study. Morbidity and mortality statistics are given for cardiovascular, lung, and blood diseases in the United States as well as for States and selected countries.

The “Background Data” chapter provides population and life-expectancy estimates, trends in total mortality, leading causes of death, prevalence of CVD risk factors, and economic cost data. The “Cardiovascular Diseases,” “Lung Diseases,” and “Blood Diseases” chapters contain detailed morbidity and mortality statistics by race/ethnic group, sex, and geographic distribution. Diseases included under the three headings are listed in the first table in each chapter together with appropriate diagnostic codes of the 9th and 10th revisions of the International Classification of Diseases (ICD) of the World Health Organization (WHO).¹⁻²

Sources of Data

Most of the data used in this book were obtained from the National Center for Health Statistics (NCHS): specifically, the annual vital statistics of the United States; the annual National Health Interview Survey (NHIS); the National Health and Nutrition Examination Survey (NHANES), 1971–75, 1976–80, and 1988–94; the National Health Examination Survey, 1960–62; the annual National Hospital Discharge Survey; and the annual National Ambulatory Medical Care Survey. International mortality data came from the World Health Organization (WHO) Web site.

It is beyond the scope of the *Chart Book* to cite all of the NCHS and Bureau of the Census publications, data tapes, and Web sites that were used. Specific data sources for current statistics and general references to hospital and prevalence surveys and vital statistics for earlier data years may be found in the “References” appendix.

Population Estimates

The NCHS and the NHLBI used annual mid-year U.S. population estimates from the Bureau of the Census to express morbidity and mortality per population. Prevalence and hospital discharge statistics were based on noninstitutionalized population estimates that were included in NCHS data sources. The annual live births were reported by NCHS and used for infant mortality rates.

Quality of Data

Quality issues discussed below include accuracy of diagnosis, data comparability, ICD classification, and sampling error.

The criteria of the source study determine the diagnosis for estimates of incidence. For disease prevalence and smoking habits, diagnosis is based on self reports from health interviews. Physical measurements are used to determine the prevalence of high serum cholesterol and overweight. Prevalence of hypertension is based on blood pressure readings and health interviews about medication. For hospital, mortality, and economic cost statistics, diagnosis is accepted as listed on medical records, death certificates, or survey forms. Those diagnoses are consistent with ICD codes, the 9th revision (1979–98), or the 10th revision for mortality only (1999–).¹⁻²

Hospital Statistics

Hospitalization rates are a useful measure of health care use. National hospitalization and hospital case-fatality statistics, however, have limitations associated with diagnostic accuracy (e.g., the diagnosis may be influenced by the billing process) and diagnostic comparability over time (e.g., ICD revisions). Time trends may not accurately reflect real changes in occurrence and case-fatality because the data occasionally include changes in hospital admission practices. Nevertheless, diagnoses obtained from hospital records have been accepted as reported.

The term *hospitalizations* as used here is synonymous with the National Hospital Discharge Survey term *hospital discharges* and refers to all patients, whether discharged alive or dead. The diagnosis given at discharge, and not at admission, is used. Most tabulations of hospitalizations are first-listed diagnoses on the hospital record, i.e., primary diagnosis. Some tabulations are of the “all-listed” diagnoses that include both primary and secondary diagnoses for a particular disease. Because the survey is event-based rather than patient-based, annual estimates pertain to numbers of hospitalizations, not to the number of patients hospitalized in a given year.

Methodological problems in data collection preclude the presentation of hospital data by race.³

Cause-of-Death Statistics

Limitations of cause-of-death statistics, apart from discontinuities over time caused by revisions in the ICD, are well known. Inaccuracies in death certification and inconsistencies in selecting and coding the underlying cause of death create uncertainties as to the true magnitude of mortality from a specific cause compared with other causes. These uncertainties also must be kept in mind when comparing the same cause of death over time or the same cause of death between demographic groups or countries. Selecting only one cause of death as the underlying cause has the advantage of diagnostic specificity, but the disadvantage of an incomplete accounting of the various causes that contributed to the death. Because of the complexity of basing mortality statistics on tabulations of both the underlying and contributing (secondary) causes of death, most data are for the underlying causes.

Another limitation related to cause-of-death statistics concerns cross-national comparisons of vital statistics. Comparisons of mortality data for coronary heart disease (CHD), stroke, chronic obstructive pulmonary disease (COPD), and asthma among countries are affected by differences in diagnostic practices and physician training, interpretation of internationally recommended rules for coding a cause of death, availability of diagnostic aids, and the use of autopsies. Information presented in this book is limited to countries that are known to produce high-quality statistics.

ICD Revisions

Revisions in the ICD (Appendix A) have affected the comparability of time trends, particularly those associated with mortality. Breaks between revisions are shown on charts where comparability is a concern.

Codes from the 10th revision were used to determine diagnoses for mortality beginning in 1999.² To compensate for the differences in mortality classification between ICD/10 and ICD/9, the NCHS derived the comparability ratios shown in Appendix B.⁴ They have been applied to 1999 and 2000 death rates to make them comparable to rates coded from 1979 to 1998. For this reason, the 1999 and 2000 death rates in certain charts are under the ICD/9 heading even though ICD/10 began in 1999.

Coding rules and practices are not universal, so differences that affect comparability of cause-specific morbidity and mortality exist in diagnosis coding by countries, States, and demographic groups.

Data Presentation

Death rates are expressed per 100,000 population using the resident population as of July 1 of the relevant year as the denominator. Prevalence, on the other hand, is expressed as the percent of the population.

Hospital discharge rates are per 10,000 population, and the percent discharged dead has numbers of discharges as the denominator. Infant mortality rates are expressed per 100,000 live births.

Age Adjustment Rates

Age-adjusted U.S. death rates are based on the 2000 age-adjustment standard, i.e., the distribution, in 10-year age groups, of the U.S. population in 2000.⁵⁻⁷ This standard is also used to summarize the age-specific prevalence for diseases and risk factors based on NHANES data. The European standard population is used for age adjustment for international mortality statistics.⁸

Age-adjusted rates are used to compare prevalence or mortality of two or more population groups or the Nation as a whole over time. The 2000 standard population is used so that these rates are unaffected by differences in the age composition of the populations being compared.

The major disadvantage of using age-adjusted rates is loss of age-specific information. This becomes evident when the population groups being compared have mortality differences that are not in the same direction over a given age range. For example, the bars in Chart 3–65 for diseases of arteries mortality show that white males have a higher age-adjusted rate than black males, but the lines in Chart 3–66 show that the rates for white males are higher only at the oldest ages.

Percent Change

Percent changes in death rates over time are calculated from log-linear regression slopes of the annual rates.⁹ They may be influenced by unusually high or low values, especially if the period is short. They do not provide information about the levels on which they are based, which might be small. Average annual percent changes should not be summed over a period because the sum will be more than the percent change from the first to the last year in the period. Average annual percent changes give the appearance of small differences in the comparisons being made. An exception to the use of log-linear regression to calculate percent change is made for Chart 3–6. For this table, it is useful to have the percent change and other calculations based on the actual death rates.

Horizontal and Vertical Scales

Comparisons between time-trend charts are complicated because ranges of the horizontal and vertical scales are not uniform and may be truncated. Vertical scales for less common diagnoses are magnified to focus on age, race, and sex differences.

Arithmetic and Logarithmic Scales

In this *Chart Book*, most time trends in death rates were plotted on an arithmetic Y-scale to show their absolute change relative to zero. Note, however, that on an arithmetic scale, the absolute increase or decrease for a smaller death rate can be modest compared with the change for a larger death rate, yet the percent change over time will be greater for the smaller rate. In addition, on an arithmetic scale, a decline can be slowing whereas the rate of decline, if plotted on a logarithmic scale, may not be slowing. Where particularly appropriate, these differences are discussed in the text.

Truncated Age Ranges

The age range for death rates in some charts excludes groups of individuals older than 84 years because of the difficulty associated with obtaining accurate diagnose for patients who often have other contributing comorbidities. Selected truncated age groups are frequently used for U.S. data to highlight specific premature adult morbidity and mortality. For international comparisons, the age range 35–74 years was chosen so that differing age distributions among countries would be minimized in rate calculations.

Demographic Characteristics

The *Chart Book* provides prevalence and mortality information for various racial and ethnic groups. Several charts show comparisons between blacks and whites. Occasionally, data for nonwhites instead of blacks are presented. While many charts provide a race/sex comparison, others present data for total males and total females or for total whites and total blacks to highlight important points that otherwise would be lost if four-way combinations were used.

The term *American Indian* is used to refer to the population that consists of American Indians and Alaska Natives. The term Asian is used to include the population that consists of Asians and Pacific Islanders. Data on socioeconomic groups are not presented because they are extensively presented elsewhere.¹⁰

State Mortality

Death rates for total population by State are shown for CVD, CHD, stroke, and COPD.¹¹ Although State maps that combine all age, race, and sex groups can be misleading, the ones included in this book show a reasonably similar geographic pattern compared with maps that are either race and sex specific or confined to a specific age range (not shown). This is true even for stroke mortality, in which high rates in the Southern States are not due merely to the large black population. Although rankings of certain States for CHD mortality differ markedly from rankings for total heart disease, the two geographic patterns are not too different.¹²

2. Background Data

The charts in this chapter provide population estimates, life expectancy, morbidity and mortality information, and economic cost data for cardiovascular, lung, and blood diseases. Most of them focus on the leading causes of death, but a few show prevalence of specific CVD risk factors. Immediately below are prevalence and incidence estimates for selected cardiovascular, lung, and blood diseases.

Cardiovascular Diseases

Table 2–1 contains prevalence estimates for the U.S. population with CVD. Individuals with multiple CVD are counted for each condition that applies to them.^{13–15}

Table 2–1. CVD Prevalence, U.S.	
CVD	61,800,000
Hypertension	50,000,000
CHD	12,600,000
Acute Myocardial Infarction (AMI)	7,500,000
Angina Pectoris	6,400,000
Stroke	4,600,000
Heart Failure	4,800,000
Congenital Heart Defects	1,000,000
Atrial Fibrillation	2,000,000

Table 2–2 provides estimates for the annual occurrence of CVD in the United States.^{16–19}

Table 2–2. CVD Incidence and Recurrence, U.S.	
Heart Attack	1,100,000
First Event	650,000
Recurrent Event	450,000
Stroke	600,000
First Event	500,000
Recurrent Event	100,000
Heart Failure	550,000
First Event	550,000

Lung Diseases

In 2000, 11.4 million U.S. adults were estimated to have COPD, i.e., chronic bronchitis (9.4 million) or emphysema (3.1 million).²⁰ Approximately 11 million people experienced at least one asthma attack in 2000.²⁰ According to NHLBI estimates, about 30,000 people have cystic fibrosis, and 2,500 new cases are reported annually. Respiratory distress syndrome occurs in 40,000 infants and 150,000 adults each year.

In this chapter, charts showing leading causes of death classify asthma with COPD and list the category as *COPD and allied conditions*. The ICD/10 term is “chronic lower respiratory diseases.”

Blood Diseases

Approximately 3.5 million people have some form of anemia.¹⁵ The NHLBI estimated that 72,000 blacks—1 of 500 black births—have sickle cell anemia, 20,000 persons have hemophilia, and 1,000 persons have Cooley’s anemia.

Chart 2–1**Total Population by Mean Age, Percent Age 65+, Race/Ethnicity, and Sex, U.S., 2002**

The mean age and percent population ages 65 and older are lower for minorities in the United States than the mean age and percent ages 65 and older are for whites. This holds true for both males and females.²¹

	Total Population			Male			Female		
	Pop. (Mil.)	Mean Age	Percent 65+	Pop. (Mil.)	Mean Age	Percent 65+	Pop. (Mil.)	Mean Age	Percent 65+
Total	280.3	36.2	12.6	137.0	35.5	10.8	143.3	38.0	14.3
White	229.5	37.7	13.6	112.8	36.4	11.6	116.7	38.9	15.5
Hispanic	(31.7)	(29.3)	(6.2)	(15.9)	(28.5)	(5.2)	(7.9)	(30.1)	(13.5)
Non-Hispanic	(197.8)	(39.0)	(14.8)	(96.9)	(37.7)	(12.6)	(100.9)	(40.3)	(16.8)
Black	36.2	32.7	8.3	17.2	31.2	6.9	19.0	34.0	9.6
Hispanic	(1.9)	(29.4)	(5.7)	(1.0)	(28.6)	(4.7)	(1.0)	30.2	(6.6)
Non-Hispanic	(34.3)	(32.9)	(8.5)	(16.2)	(31.3)	(7.1)	(18.0)	(34.2)	(9.7)
American Indian	2.5	31.0	7.1	1.2	30.2	6.0	1.3	31.8	8.0
Asian	12.0	33.2	7.8	5.8	32.2	6.9	6.3	34.2	8.7
Hispanic*	34.8	29.3	6.1	17.4	28.5	5.1	17.3	30.1	7.1

* Hispanic can be of any race.

Note: Estimates of numbers of Hispanic American Indians and Hispanic Asians are not provided separately.

Chart 2–2**Total Population by Mean Age, Percent Age 65+, Race/Ethnicity, and Sex, U.S., 2020**

The mean age and percent population ages 65 and older of minorities, projected to 2020, in the United States will still be lower than the mean age and percent ages 65 and older for whites. The same will be true for males and females. The population size for all groups, ages 65 and older, is projected to increase.^{5, 21}

	Total Population			Male			Female		
	Pop. (Mil.)	Mean Age	Percent 65+	Pop. (Mil.)	Mean Age	Percent 65+	Pop. (Mil.)	Mean Age	Percent 65+
Total	324.9	39.2	16.5	158.9	38.0	14.8	166.1	40.3	18.2
White	257.4	40.0	17.8	126.7	38.9	16.0	130.7	41.2	19.5
Hispanic	(50.3)	(31.9)	(8.6)	(25.1)	(31.0)	(7.5)	(25.2)	(32.7)	(6.2)
Non-Hispanic	(207.1)	(42.0)	(20.0)	(101.6)	(40.8)	(18.1)	(105.5)	(43.2)	(21.8)
Black	44.7	36.1	12.0	21.3	34.5	10.3	23.4	37.5	13.6
Hispanic	(3.2)	(32.6)	(9.2)	(1.5)	(31.5)	(8.3)	(1.6)	(33.4)	(10.0)
Non-Hispanic	(41.5)	(36.4)	(12.3)	(19.8)	(34.8)	(10.5)	(21.8)	(37.8)	(13.8)
American Indian	3.2	33.9	10.3	1.6	33.0	8.8	1.6	34.7	11.8
Asian	19.6	36.0	11.5	9.2	34.7	10.4	10.3	37.1	12.5
Hispanic*	55.2	31.9	8.7	27.4	31.0	7.5	27.7	32.7	9.8

* Hispanic can be of any race.

Note: Estimates of numbers of Hispanic American Indians and Hispanic Asians are not provided separately.

Chart 2–3

Average Remaining Lifetime Years by Age, Race, and Sex, U.S., 1999

In 1999, average life expectancy at birth was 76.7 years—79.4 years for females compared with 73.9 for males and 77.3 years for whites compared with 71.4 years for blacks.²²

Year	Total	Male	Female	Total White	White Male	White Female	Total Black	Black Male	Black Female
Birth	76.7	73.9	79.4	77.3	74.6	79.9	71.4	67.8	74.7
15	62.5	59.7	65.1	63.0	60.3	65.5	57.8	54.3	61.0
35	43.5	41.0	45.7	43.9	41.5	46.1	39.3	36.3	41.9
65	17.7	16.0	19.1	17.8	16.1	19.2	16.0	14.3	17.3
75	11.2	9.9	12.1	11.2	10.0	12.1	10.4	9.2	11.1

Chart 2–4

Leading Chronic Conditions Causing Limitation of Activity, U.S., 2000

In 2000, heart disease was the third leading chronic condition causing activity limitation. Hypertension, lung condition, and stroke were also common.²⁰

Chronic Condition	Persons (Millions)
Arthritis	5.9
Back/neck conditions	5.2
Heart condition	4.4
Injury	3.7
Hypertension	3.0
Diabetes	2.8
Lung condition	2.6
Mental condition	2.5
Vision condition	2.1
Stroke	1.6
Musculoskeletal condition	1.3
Cancer	1.3
Hearing condition	1.2

Chart 2–5**Age-Adjusted Death Rates for All Causes by Race and Sex, U.S., 1950–2000**

Between 1950 and 2000, the all-cause death rate declined for blacks and whites and for males and females. It remained higher in males than in females. Within sex groups, the rate was higher in blacks than in whites.^{11, 22–26}

Year	Deaths/100,000 Population			
	White Male	White Female	Black Male*	Black Female*
1950	1,642.5	1,184.0	1,949.5	1,574.1
1951	1,621.7	1,178.6	1,902.4	1,539.4
1952	1,588.5	1,157.0	1,889.8	1,496.0
1953	1,589.0	1,146.5	1,865.3	1,469.0
1954	1,516.3	1,081.8	1,726.6	1,326.3
1955	1,544.7	1,095.4	1,707.5	1,326.7
1956	1,554.3	1,089.9	1,724.1	1,331.9
1957	1,581.7	1,104.1	1,797.0	1,374.6
1958	1,573.1	1,090.8	1,779.2	1,354.6
1959	1,552.1	1,065.2	1,724.6	1,304.9
1960	1,586.0	1,074.4	1,777.6	1,334.6
1961	1,547.3	1,038.8	1,725.2	1,296.4
1962	1,579.1	1,052.6	1,801.7	1,324.5
1963	1,614.7	1,062.6	1,859.0	1,347.8
1964	1,572.0	1,030.8	1,768.0	1,282.7
1965	1,589.9	1,026.7	1,791.0	1,266.0
1966	1,595.7	1,024.7	1,832.4	1,274.9
1967	1,566.9	992.9	1,767.2	1,209.7
1968	1,581.8	1,029.4	1,876.9	1,277.5
1969	1,549.8	1,008.4	1,814.1	1,274.9
1970	1,513.7	944.0	1,872.8	1,229.4
1971	1,514.4	933.4	1,836.1	1,196.8
1972	1,520.2	878.9	1,871.8	1,181.2
1973	1,507.2	921.4	1,849.5	1,179.7
1974	1,450.8	884.2	1,769.5	1,109.7
1975	1,391.0	834.1	1,697.0	1,042.4
1976	1,379.5	828.9	1,676.0	1,031.2
1977	1,343.5	799.7	1,647.9	1,012.2
1978	1,332.5	796.6	1,625.6	954.4
1979	1,289.6	770.2	1,604.5	969.2
1980	1,317.6	796.1	1,697.8	1,033.3
1981	1,282.2	773.6	1,626.6	986.6
1982	1,255.9	758.7	1,580.4	960.1
1983	1,259.4	763.9	1,600.7	980.7
1984	1,245.9	760.7	1,600.8	976.8
1985	1,249.8	764.3	1,634.5	994.4
1986	1,230.4	758.1	1,650.1	994.4
1987	1,213.4	753.3	1,650.3	989.7
1988	1,215.9	759.0	1,677.6	1,006.8
1989	1,176.6	738.8	1,670.1	998.1
1990	1,165.9	728.7	1,644.6	975.1
1991	1,146.4	719.8	1,622.0	967.9
1992	1,125.6	709.5	1,591.4	954.4
1993	1,143.0	728.9	1,629.4	977.7
1994	1,123.4	723.5	1,592.5	965.0
1995	1,112.7	726.6	1,582.3	965.6
1996	1,092.0	725.9	1,503.4	948.1
1997	1,062.5	718.3	1,446.7	940.7
1998	1,038.5	715.1	1,410.6	938.2
1999	1,035.8	725.8	1,412.7	955.0
2000	1,019.3	723.4	1,371.3	943.9

* Nonwhite from 1950–1967.

Chart 2–6**Crude Death Rates for Selected Causes, U.S., 1950–2000**

Among the leading causes of death, lung cancer and COPD, and to a lesser extent other cancers, increased as CHD and stroke mortality decreased. Although the rates of decline for CHD and stroke were similar, the absolute decline was greater for CHD than for stroke.^{11, 22–25}

Year	Deaths/100,000 Population				
	CHD	Stroke	Lung Cancer	Other Cancer	COPD
1950	262.8	104.0	12.2	127.6	2.1
1951	265.8	106.7	12.9	127.6	2.4
1952	269.6	106.8	13.9	129.5	2.4
1953	277.2	107.3	14.9	129.8	2.9
1954	272.2	104.1	15.4	130.2	3.1
1955	282.7	106.0	16.3	130.2	3.4
1956	289.2	106.3	17.4	130.4	3.9
1957	298.7	110.2	18.1	130.5	4.8
1958	296.8	110.1	18.6	128.2	5.4
1959	297.4	108.4	19.4	127.9	5.9
1960	304.7	108.0	20.3	128.9	6.9
1961	301.6	105.4	21.3	128.1	7.2
1962	311.1	106.3	22.3	127.6	8.6
1963	317.6	106.7	23.1	128.2	10.3
1964	311.2	103.7	24.0	127.3	10.6
1965	314.0	103.9	25.0	128.4	12.1
1966	318.5	104.7	26.3	128.8	12.9
1967	315.0	102.4	27.6	129.6	13.3
1968	338.4	106.0	29.8	130.0	15.2
1969	332.6	102.9	30.7	129.7	15.6
1970	328.1	101.9	32.1	130.7	16.2
1971	326.0	101.1	33.2	129.8	16.7
1972	327.0	101.9	34.7	130.2	17.5
1973	323.7	101.4	35.5	130.4	18.5
1974	311.6	97.2	37.0	131.7	18.4
1975	298.3	90.1	38.1	131.2	19.1
1976	297.0	86.7	39.7	133.1	20.2
1977	290.5	82.8	41.2	134.2	20.3
1978	289.2	79.1	42.8	135.9	21.9
1979	274.9	75.5	43.8	135.8	21.1
1980	280.5	75.1	45.8	138.0	23.5
1981	272.0	71.3	46.4	137.5	24.3
1982	268.0	68.1	48.1	139.1	24.5
1983	267.3	66.6	49.2	140.3	26.8
1984	259.9	65.4	50.3	141.9	27.8
1985	255.6	64.3	51.5	142.4	29.7
1986	247.1	62.3	52.3	143.2	30.2
1987	241.2	61.8	53.6	143.1	30.5
1988	238.1	61.6	54.5	143.8	32.0
1989	230.3	59.0	55.5	145.3	32.2
1990	224.3	57.9	56.8	146.2	32.9
1991	219.9	56.9	57.0	147.0	33.9
1992	215.2	56.4	57.2	146.8	34.1
1993	218.2	58.2	57.7	147.8	37.2
1994	212.2	58.9	57.4	147.8	36.9
1995	210.2	60.1	57.5	147.4	37.0
1996	205.2	60.3	57.3	146.0	37.8
1997	199.1	59.7	57.3	144.3	38.7
1998	194.7	58.6	57.1	143.1	39.6
1999	195.8	58.4	56.7	144.4	43.7
2000	186.6	57.0	57.2	141.9	42.8

Chart 2–7**Age-Adjusted Death Rates by Major Diagnosis, U.S., 1989–1998**

Between 1989 and 1998, age-adjusted death rates for cardiovascular and respiratory diseases ranked first and third, respectively.¹¹

Diagnosis	Deaths/100,000 Population									
	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Cardiovascular	425.0	412.5	401.6	392.3	397.6	387.1	384.3	375.5	366.0	355.2
Neoplasms	217.1	219.0	218.7	217.3	217.6	216.1	214.7	211.6	208.6	205.4
Respiratory	84.1	85.5	84.5	82.3	87.8	86.0	85.9	86.2	87.6	89.6
Injury and Poisoning	61.2	60.4	59.3	57.4	58.9	58.3	57.8	56.9	56.1	55.7
Endocrine	27.7	27.7	28.0	28.2	29.8	30.7	31.6	32.2	32.5	33.0
Digestive	33.9	33.1	32.5	32.1	31.7	31.4	30.7	30.3	30.4	29.8
Mental	11.7	11.9	12.2	12.7	14.3	15.5	16.7	17.5	18.5	20.0
Musculoskeletal	3.3	3.4	3.3	3.2	3.4	3.5	3.7	3.7	3.9	3.8

Chart 2–8**Leading Causes of Death, U.S., 2000**

In 2000, heart disease, stroke, and COPD and allied conditions were the first, third, and fourth leading causes of death, respectively.²⁴

Cause of Death	Number
Total	2,404,624
1 Heart disease*	709,894
2 Cancer	551,833
3 Cerebrovascular disease (stroke)	166,028
4 COPD and allied conditions**	123,550
5 Accidents	93,592
6 Diabetes	68,662
7 Influenza and pneumonia	67,024
8 Alzheimer's disease	49,044
9 Nephritis	37,672
10 Septicemia	31,613
All other causes of death	505,712

* Includes 529,659 deaths from coronary heart disease.

** Chronic lower respiratory diseases.

Chart 2–9**Leading Causes of Death by Age and Rank, U.S., 2000**

In 2000, heart disease was the third leading cause of death for those ages 25–44, second for those ages 45–64, and first for those ages 65 and older. Stroke ranked fourth for those ages 45–64 and third for those ages 65 and older. COPD and allied conditions ranked fourth for those ages 65–84 and fifth for those ages 45–64.^{24, 26}

Cause of Death	Rank				
	1–24	25–44	45–64	65–84	85+
Heart disease	5	3	2	1	1
Cancer	4	2	1	2	2
Cerebrovascular disease	9	8	4	3	3
Accidents	1	1	3	9	9
COPD and allied conditions*	8	—	5	4	6
Influenza and pneumonia	7	10	—	6	4
Diabetes mellitus	—	9	6	5	7
Suicide	3	4	8	—	—
Chronic liver disease	—	7	7	—	—
Nephritis and nephrosis	—	—	10	8	8
Homicide	2	6	—	—	—
Septicemia	—	—	—	10	10
HIV infection	10	5	9	—	—
Congenital anomalies	6	—	—	—	—
Alzheimer's disease	—	—	—	7	5

* Chronic lower respiratory diseases.

Chart 2–10**Leading Causes of Death, White Males, U.S., 2000**

In 2000, heart disease, COPD and allied conditions, and stroke were the first, third, and fourth leading causes of death among white males, respectively.²⁶

Cause of Death	Percent
Heart Disease	29.9
Cancer	24.5
COPD*	5.5
Stroke	5.4
Accidents	5.0
Diabetes	2.6

* COPD and allied conditions.

Chart 2–11**Leading Causes of Death, White Females, U.S., 2000**

In 2000, heart disease, stroke, and COPD and allied conditions were the first, third, and fourth leading causes of death among white females, respectively.²⁶

Cause of Death	Percent
Heart Disease	30.1
Cancer	21.8
Stroke	8.3
COPD*	5.5
Influenza/Pneumonia	3.2
Alzheimer's Disease	3.0

* COPD and allied conditions.

Chart 2–12

Leading Causes of Death, Black Males, U.S., 2000

In 2000, heart disease and stroke were the first and fourth leading causes of death among black males, respectively.²⁶

Cause of Death	Percent
Heart Disease	25.2
Cancer	22.6
Accidents	5.6
Stroke	5.5
Homicide	4.4
HIV Disease	3.7

Chart 2–13

Leading Causes of Death, Black Females, U.S., 2000

In 2000, heart disease and stroke were the first and third leading causes of death among black females, respectively.²⁶

Cause of Death	Percent
Heart Disease	28.9
Cancer	20.6
Stroke	7.9
Diabetes	5.1
Nephritis	2.7
Accidents	2.5

Chart 2–14

Leading Causes of Death, Asian Males, U.S., 1999

In 1999, heart disease, stroke, and COPD and allied conditions were the first, third, and fifth leading causes of death among Asian males, respectively.²⁷

Cause of Death	Percent
Heart Disease	28.1
Cancer	25.3
Stroke	8.1
Accidents	5.3
COPD*	3.9
Diabetes	2.8

* COPD and allied conditions.

Chart 2–15

Leading Causes of Death, Asian Females, U.S., 1999

In 1999, heart disease, stroke, and COPD and allied conditions were the second, third, and sixth leading causes of death among Asian females, respectively.²⁷

Cause of Death	Percent
Cancer	25.6
Heart Disease	24.1
Stroke	9.9
Diabetes	3.8
Accidents	3.7
COPD*	2.5

* COPD and allied conditions.

Chart 2–16**Leading Causes of Death, Hispanic Males, U.S., 1999**

In 1999, heart disease and stroke were the first and fourth leading causes of death among Hispanic males, respectively.²⁷

Cause of Death	Percent
Heart Disease	23.4
Cancer	18.4
Accidents	11.3
Stroke	4.8
Homicide	4.1
Diabetes	4.0

Chart 2–17**Leading Causes of Death, Hispanic Females, U.S., 1999**

In 1999, heart disease, stroke, and COPD and allied conditions were the first, third, and sixth leading causes of death among Hispanic females, respectively.²⁷

Cause of Death	Percent
Heart Disease	26.9
Cancer	20.9
Stroke	6.8
Diabetes	5.8
Accidents	4.5
COPD*	2.9

* COPD and allied conditions.

Chart 2–18**Leading Causes of Death, American Indian Males, U.S., 1999**

In 1999, heart disease and stroke were the first and sixth leading causes of death among American Indian males, respectively.²⁷

Cause of Death	Percent
Heart Disease	21.4
Cancer	15.6
Accidents	14.6
Diabetes	5.3
Chronic Liver Disease	4.9
Stroke	3.9

Chart 2–19**Leading Causes of Death, American Indian Females, U.S., 1999**

In 1999, heart disease and stroke were the first and fifth leading causes of death among American Indian females, respectively.²⁷

Cause of Death	Percent
Heart Disease	21.1
Cancer	17.0
Accidents	8.3
Diabetes	7.7
Stroke	5.9
Chronic Liver Disease	4.1

Chart 2–20**Number of Days of Inpatient Hospital Care by Major Diagnosis, U.S., 1989–1999**

Between 1989 and 1999, cardiovascular and respiratory diseases ranked first and second, respectively, in the number of days for which inpatients received hospital care.^{28–29}

Diagnosis	Days of Care (Millions)										
	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Cardiovascular	39.29	37.90	38.97	39.38	37.47	36.12	33.64	33.73	32.45	32.59	30.82
Respiratory	20.13	20.43	20.65	19.75	21.09	19.60	19.89	19.15	19.62	19.22	20.05
Mental	19.25	18.82	18.97	18.58	18.81	20.94	17.86	16.49	15.63	15.05	15.09
Digestive	20.73	19.20	19.35	18.40	17.49	16.83	15.79	14.75	14.57	14.68	15.06
Injury and Poisoning	19.09	18.89	19.14	16.86	17.29	15.22	14.58	13.83	13.23	13.60	13.83
Neoplasms	16.69	16.77	16.41	15.38	13.64	13.23	11.83	11.18	10.89	10.84	10.50
Musculoskeletal	10.23	10.22	10.22	10.02	9.04	8.19	7.30	7.16	6.77	6.53	6.65
Endocrine	7.51	7.61	8.09	7.49	7.95	7.42	6.82	6.77	6.62	6.33	6.59

Chart 2–21**Percent* of Population Currently Smoking by Race and Sex, Age 18+, U.S., 1965–1999**

Between 1965 and 1990, the percent of the population, ages 18 and over, who smoked cigarettes decreased significantly. During the 1990s, the percent of the population who smoked remained relatively stable.²⁷

Year	White Male	White Female	Black Male	Black Female
1965	50.4	33.9	58.8	31.8
1966				
1967				
1968				
1969				
1970				
1971				
1972				
1973				
1974	41.7	32.1	53.6	35.6
1975				
1976				
1977				
1978				
1979	36.4	30.3	43.9	30.5
1980				
1981				
1982				
1983	34.2	29.6	41.7	31.3
1984				
1985	31.3	27.9	40.2	30.9
1986				
1987				
1988				
1989				
1990	27.6	23.5	32.8	20.8
1991				
1992	27.7	25.3	33.3	24.5
1993	26.6	23.4	33.7	20.6
1994	27.1	24.0	34.3	21.6
1995	26.2	23.4	29.4	23.5
1996				
1997	26.8	22.8	32.4	22.5
1998	26.0	23.0	29.0	21.1
1999	25.0	22.5	28.5	20.7

* Age adjusted.

Chart 2–22**Percent* of Population With High Serum Cholesterol by Race and Sex, Ages 20–74, U.S., 1971–74 to 1988–94**

Prevalence of high total serum cholesterol declined in white and black males and females between 1971–74 and 1988–94; between 1976–80 and 1988–94, it also declined in Mexican-American males and females.²⁷

Period	White Male	White Female	Black Male	Black Female	Mexican-American Male	Mexican-American Female
1971–74	27.9	28.9	26.6	30.5		
1976–80	26.4	29.2	25.8	26.2	20.3	20.5
1988–94	19.1	20.7	16.4	19.3	18.7	17.7

* Age adjusted.

Note: High serum cholesterol is 240+ mg/dL.

Chart 2–23**Percent* of Population That Is Overweight, by Race and Sex, Ages 20–74, U.S., 1971–74 to 1988–94**

For each race-sex group, the prevalence of overweight males and females increased between 1976–80 and 1988–94.²⁷

Period	White Male	White Female	Black Male	Black Female	Mexican-American Male	Mexican-American Female
1971–74	55.4	38.8	50.4	60.5		
1976–80	53.8	39.4	51.4	63.2	61.6	61.7
1988–94	62.3	49.4	58.0	68.5	69.4	69.6

* Age adjusted.

Note: Overweight is a body mass index of 25 kg/m².

Chart 2–24**Economic Cost in Billions of Dollars of Cardiovascular, Lung, and Blood Diseases, U.S., 2002**

Annual expenditure for health and lost productivity due to cardiovascular, lung, and blood diseases cost the Nation billions of dollars. Costs for these diseases as secondary causes of morbidity and mortality were not included.^{25, 30–38}

Disease	Total	Direct	Morbidity	Mortality
Total CVD	329.2	199.5	30.9	98.8
Heart disease	214.0	115.0	19.0	80.0
Coronary	111.8	58.2	8.4	45.2
Congestive Heart Failure	23.2	21.4	*	1.8
Stroke	49.4	30.8	5.6	13.0
Hypertensive disease	47.2	34.4	6.7	6.1
Selected lung diseases	115.9	65.4	23.8	26.7
COPD	32.1	18.0	6.8	7.3
Asthma	14.0	9.4	2.7	1.9
Selected blood disease	9.7	7.1	0.7	1.9
Anemias	6.4	4.9	0.6	0.9

* No estimate available.

Chart 2–25**Direct Cost in Billions of Dollars of Cardiovascular, Lung, and Blood Diseases, U.S., 2002**

Among the direct cost (health expenditures) for cardiovascular, lung, and blood diseases (except stroke), hospital care ranked highest. For stroke, the expenditure for nursing home care was slightly higher than the cost of hospital care.^{30–34, 37}

Disease	Total	Hospital Care	Physicians Services*	Prescription Drugs	Home Health Care	Nursing Home Care
Total CVD	199.5	88.6	29.9	31.8	11.7	37.5
Heart disease	115.0	62.8	15.3	13.5	5.2	18.2
Coronary	58.2	32.2	8.6	6.2	1.6	9.6
CHF	21.4	11.9	1.6	2.0	2.4	3.5
Stroke	30.8	12.0	2.4	0.8	3.1	12.6
Hypertensive disease	34.4	4.8	8.6	15.5	1.7	3.7
Selected lung diseases	65.4	38.8	9.9	11.1	2.2	3.4
COPD	18.0	7.3	3.4	3.7	0.8	2.7
Asthma	9.4	3.1	2.6	3.7	**	**
Selected blood diseases	7.1	3.5	1.6	0.5	0.8	0.8
Anemias	4.9	2.2	1.1	0.4	0.5	0.7

* Physicians, clinics, and other professional services.

** No estimate available.

3. Cardiovascular Diseases

The diagnostic group *cardiovascular diseases* as used here includes diseases and congenital anomalies of the circulatory system as coded in the ICD.

Charts 3–1 through 3–3 show the distribution in 1999 of CVD deaths, heart disease deaths, and stroke deaths, respectively. Chart 3–4 contains a list of CVD; their 9th revision ICD codes; 1999 estimates of hospital discharges, length of stay, and physician office visits for the diagnostic codes; 10th revision ICD codes for the CVD; and number of deaths in 1999 for those codes. Subsequent charts display morbidity and mortality for total CVD, total heart disease, and selected subgroups.

Coronary Heart Disease

AMI and other CHD account for almost 75 percent of all heart disease deaths (Chart 3–2). Identifying CHD as the underlying cause of death, however, is sometimes difficult because the diagnostic information available at the time of death can be insufficient to distinguish accurately among the various forms of heart disease. This applies to AMI and angina pectoris—two conditions included under the CHD category. Although their classifications may be of limited use in identifying general mortality, it is useful for hospitalization and office visit statistics and for prevalence.

Over the years, multiple revisions of the ICD have led to changes in the codes for CHD. These revisions complicate the determination of mortality trends because subgroups within the categories change. The category CHD, in the ICD/10, was expanded to include “Atherosclerotic CVD.” Therefore, CHD death rates prior to ICD/10 coding (1999) were tabulated to include the additional term to ensure uniformity in classification of CHD mortality from 1950 to 2000. As a result, these CHD death rates are higher than those in previous issues of the *Chart Book*.

Congestive Heart Failure

CHF is a sequela of various heart diseases. It is a heart “condition,” not a heart “disease,” and is more common as a contributing rather than an underlying cause of death. Thus, it is imprecise to classify CHF as an underlying cause of death. The condition, however, is increasingly prevalent and common in hospitalizations and mortality reporting. In fact, hospitalizations and mortality for CHF have increased (until very recently), while mortality for total heart diseases has declined.

Cardiomyopathy

In 1999, more than 27,000 deaths were attributed to cardiomyopathy even though no consensus exists on classification and diagnostic criteria for the disease. It is assumed that this limitation has little effect on any mortality differences influenced by age, race, or sex.

Atrial Fibrillation and Other Heart Diseases

The number of patients hospitalized with atrial fibrillation has been increasing, but the number of deaths caused by it is uncertain because the diagnostic information on the death certificate is inadequate. Diseases of pulmonary circulation, acute and subacute endocarditis, and cardiac dysrhythmias are additional heart diseases of interest. Because measures of their morbidity, and especially their mortality are of uncertain quality, no charts pertaining to them have been included.

Hypertensive Disease

Prevalence and trend data on awareness, treatment, and control of hypertension are important statistics associated with hypertension morbidity and have therefore been included in this chapter. Mortality statistics for hypertensive disease are not described because it is not a distinct underlying cause of death. In fact, its presence on death certificates is often arbitrary, and its selection as the underlying cause of death is often characterized by a lack of good diagnostic information at the time of death.

Cerebrovascular Diseases (Stroke)

Cerebrovascular disease, i.e., stroke, is the third leading cause of death. Only a small proportion of deaths from stroke can be classified as cerebral hemorrhage, occlusion, thrombosis, or embolism. Most are coded to unspecified forms of cerebrovascular disease (Chart 3–3). Thus, mortality for the entire category is presented in charts related to stroke.

Diseases of Arteries

The ICD term “diseases of arteries” is used to refer to peripheral vascular disease and includes a variety of atherosclerotic disorders; none of them specifically involve the heart or brain. Examples are aortic aneurysm, atherosclerosis of the extremities, arterial embolism and thrombosis, and generalized atherosclerosis. Mortality data are presented, but valid prevalence estimates are unavailable.

Congenital Anomalies of the Circulatory System

The ICD term “congenital anomalies of the circulatory system” includes congenital heart disease. Because most deaths in this category occur in infants younger than 1 year of age, the preferred mortality tabulation is the infant mortality rate.

Cardiovascular Diseases

Chart 3–1

Cardiovascular Disease Deaths, Percent by Subgroup, U.S., 1999

Cause of Death	Percent
CHD	55.2
Other Heart Diseases	15.1
Stroke	17.5
Diseases of Arteries	4.2
Other CVD	2.7
Congestive Heart Failure	5.3

Total Deaths = 958,775 (100%), including congenital CVD, ICD/10 codes Q20–Q28.

Chart 3–2

Heart Disease Deaths, Percent by Subgroup, U.S., 1999

Cause of Death	Percent
Other CHD	45.3
AMI	27.3
Congestive Heart Failure	7.0
Hypertensive	5.9
Rhythmic	5.4
Other	4.3
Cardiomyopathy	3.7
Rheumatic/Congenital	1.1

Total Deaths = 729,628 (100%), including congenital heart disease, ICD/10 codes Q20–Q24.

Chart 3–3
Stroke Deaths, Percent by Subgroup, U.S., 1999

Cause of Death	Percent
Stroke, Unspecified	54.4
Other Hemorrhage	15.2
Sequelae of Cerebrovascular Disease	12.6
Cerebral Infarction	8.9
Other	5.0
Subarachnoid Hemorrhage	3.9

Total Deaths = 167,366 (100%)

Chart 3–4
Number of Hospitalizations, Physician Office Visits, and Deaths for Cardiovascular Diseases, U.S., 1999

Diagnostic Category	ICD/9 Codes	Hospitalizations		Physician Office Visits (1,000)	ICD/10 Codes	Deaths
		First-Listed Discharge (1,000)	Length of Stay (Days)			
Total	390–459, 745–747	6,398	4.9	60,425	I00–I99, Q20–Q28	958,775
Heart disease	390–398, 402, 404–429	4,465	4.7	19,252	I00–I09, I11, I13, I20–I51	725,192
Rheumatic heart disease	390–398	42	7.0	196	I00–I09	3,676
Hypertensive heart disease	402, 404	127	5.2	550	I11, I13	26,029
Coronary heart disease:	410–414, 429.2	2,262	4.4	10,070	I20–I25	529,659
AMI	410	829	5.6	133	I21, I22	199,454
Angina pectoris	413	82	2.5	910	I20	503
Atherosclerotic CVD	429.2	8	4.1	512	I25.0	71,926
Other CHD	411, 412, 414	1,351	3.8	8,515	Other I23–I25	257,776
Diseases of pulmonary circulation	415–417	106	7.1	107	I26–I28	13,244
Pulmonary embolism	415.1	90	7.5	92	I26	9,008
Other	415.0, 415.2–417	13	5.7	15	I27–I28	4,236
Subacute bacterial endocarditis	421	14	12.5	0	I33.0	1,088
Cardiomyopathy	425	35	5.7	513	I42	27,260
Atrial fibrillation and flutter	427.3	384	3.6	2,312	I48	8,338
Other arrhythmic disorders	Other 427	310	3.6	1,311	Other I43–I49	31,638
Heart failure	428	975	5.5	2,684	I50	54,913
Congestive heart failure	428.0	962	5.5	2,618	I50.0	50,824
Left heart failure and unspecified	428.1–428.9	13	3.3	66	I50.1, I50.9	4,089
Other heart disease	Other 420–429	191	5.3	1,508	Other I30–I52	29,347
Other hypertensive disease	401, 403	312	3.3	32,172	I10–I12	16,968
Cerebrovascular diseases	430–438	961	5.4	2,409	I60–I69	167,366
Diseases of arteries:	440–448	286	6.8	1,993	I70–I79	40,788
Atherosclerosis	440	120	6.4	222	I70	14,979
Aortic aneurysm	441	63	8.6	141	I71	15,807
Other diseases of arteries	442–448	102	6.1	1,630	I72–I78	10,002
Deep vein thrombosis	451.1	13	6.7	0	I80.2	1,727
Other and unspecified CVD	Other 451–459	297	5.2	4,138	Other I80–I99	2,298
Congenital malformations of CV system	745–747	54	8.5	461	Q20–Q28	4,436
Congenital heart disease	475–746	38	9.5	375	Q20–Q24	3,551
Other congenital CVD	747	16	6.1	86	Q25–Q28	885

Note: Estimates of hospitalizations and physician office visits are subject to sampling variability. Estimates of hospitalizations below 50,000 have a relative standard error of more than 11 percent. Estimates of physician office visits below 588,000 have a relative standard error of more than 30 percent.

Compiled from references 11, 25, 28, and 32.

Chart 3–5

Change in Age-Adjusted Death Rates Since 1950, U.S., 1950–2000

The CHD death rate increased 10 percent from 1950 to its peak in 1968; by 2000, it was 58 percent lower than it was in 1950. Stroke mortality, on the other hand, declined for most of those years and by 2000 was 68 percent lower than it was in 1950. By comparison, the death rate for noncardiovascular causes decreased only 12 percent since 1950.^{11, 22–26}

Year	Percent Change		
	CHD	Stroke	Non-CVD
1950	0.0	0.0	0.0
1951	-1.3	0.4	-2.0
1952	-1.9	-0.3	-4.5
1953	0.0	-0.8	-6.0
1954	-3.1	-4.0	-11.6
1955	0.1	-1.9	-11.8
1956	1.6	-1.8	-12.0
1957	4.1	1.2	-10.6
1958	4.3	1.3	-12.6
1959	3.7	-0.9	-14.0
1960	5.5	-1.6	-11.5
1961	3.7	-4.2	-14.8
1962	6.9	-3.7	-13.2
1963	8.8	-3.8	-10.5
1964	5.4	-7.6	-12.9
1965	6.1	-8.0	-12.2
1966	5.9	-7.5	-11.4
1967	3.3	-11.8	-13.2
1968	9.8	-10.1	-9.8
1969	6.9	-14.0	-11.3
1970	1.9	-18.3	-13.4
1971	2.0	-18.3	-14.8
1972	1.4	-18.5	-14.1
1973	-0.6	-19.7	-14.5
1974	-5.7	-24.3	-17.1
1975	-11.7	-31.7	-18.9
1976	-13.0	-35.0	-18.8
1977	-16.2	-38.9	-20.5
1978	-17.6	-42.6	-19.8
1979	-22.8	-46.2	-21.1
1980	-21.5	-46.6	-18.1
1981	-25.0	-50.4	-19.2
1982	-27.1	-53.3	-20.4
1983	-28.1	-55.0	-18.7
1984	-30.8	-56.3	-17.8
1985	-32.6	-57.6	-15.6
1986	-35.5	-59.5	-14.9
1987	-37.7	-60.3	-14.4
1988	-38.9	-60.8	-12.5
1989	-41.4	-62.9	-12.3
1990	-43.2	-63.7	-13.0
1991	-45.0	-64.9	-13.3
1992	-46.7	-65.6	-14.2
1993	-46.6	-65.0	-11.7
1994	-48.6	-65.0	-11.8
1995	-49.5	-64.6	-11.6
1996	-51.3	-64.9	-12.4
1997	-53.2	-65.8	-13.8
1998	-55.0	-67.1	-13.8
1999	-55.5	-67.7	-12.6
2000	-57.5	-68.4	-12.1

Chart 3–6

Age-Adjusted Death Rates and Percent Change for All Causes and Cardiovascular Diseases, U.S., 1970 and 2000

Between 1970 and 2000, the CVD death rate declined 51 percent compared with 2 percent for all non-CVD causes of death. CHD and stroke mortality declined 58 percent and 62 percent, respectively. CHF, however, more than doubled.^{11, 22–26}

Cause of Death	Deaths/100,000 Pop.		1970–2000 Difference	Percent Change
	1970	2000		
All causes	1,222.6	872.4	-350.2	-28.6
CVD*	698.9	341.0	-357.9	-51.2
CHD	448.0	186.6	-261.4	-58.3
CHF	8.3	19.1	10.8	130.1
Stroke	147.7	56.8	-90.9	-61.5
Other CVD	94.9	78.5	-16.4	-17.3
Non-CVD	523.7	531.4	7.7	1.5

* Excludes congenital anomalies of the circulatory system.

Chart 3–7

Average Annual Percent Change in Age-Adjusted Death Rates for All Causes and Cardiovascular Diseases, U.S., 1965–2000

CVD mortality declines continued. The latest average annual percent declines were 2.3 percent for CVD, 3.3 percent for CHD, and 2.4 percent for stroke.^{11, 22–26}

Period	All Causes	Total CVD*	CHD	Stroke	Other CVD	All Other Causes
1965–1970	-1.1	-1.9	-1.1	-2.2	-3.4	-0.1
1970–1975	-2.0	-2.7	-2.7	-3.2	-2.2	-1.2
1975–1980	-1.4	-2.4	-2.5	-5.2	-0.1	-0.1
1980–1985	-0.9	-2.4	-3.0	-4.4	0.1	0.6
1985–1990	-1.0	-2.9	-3.4	-3.0	-2.2	0.8
1990–1995	-0.3	-1.3	-2.3	-0.3	-0.1	0.5
1995–2000	-1.0	-2.3	-3.3	-2.4	-0.1	-0.1

* Excludes congenital anomalies of the circulatory system.

Chart 3–8

Average Annual Percent Change in Age-Adjusted Death Rates for All Causes and Cardiovascular Diseases by Race and Sex, U.S., 1990–2000

Between 1990 and 2000, declines in CVD, CHD, and stroke mortality were greater in males than in females. By sex, declines in CVD and CHD were greater for whites than blacks, while the decline in stroke was greater for blacks than whites.^{11, 22–26}

Cause of Death	Total	White Male	White Female	Black Male	Black Female
All causes	-0.7	-1.3	0.0	-2.0	-0.4
CVD	-1.8	-2.4	-1.4	-2.2	-1.2
Heart disease	-2.0	-2.5	-1.6	-2.4	-1.5
Coronary	-2.8	-3.2	-2.6	-2.6	-1.8
CHF*	1.4	1.0	2.0	0.1	0.7
Stroke	-1.1	-1.5	-0.7	-2.2	-1.3
Non-CVD	0.1	-0.6	1.0	-1.8	0.3

* 1990–1999.

Chart 3–9**Deaths and Age-Adjusted Death Rates for Major Cardiovascular Diseases, U.S., 1979–2000**

Age-adjusted CVD death rates declined considerably between 1979 and 2000, despite only a very modest decline in the total number of CVD deaths.^{11, 22, 24}

Year	Deaths in Thousands	Deaths/100,000 Population
1979	958	531.1
1980	988	541.2
1981	973	517.4
1982	968	502.7
1983	981	499.1
1984	973	485.2
1985	978	478.4
1986	968	464.2
1987	964	453.1
1988	969	448.4
1989	932	423.1
1990	916	410.6
1991	916	399.9
1992	914	390.6
1993	948	396.0
1994	941	385.5
1995	951	382.6
1996	951	373.8
1997	944	364.4
1998	940	353.2
1999	952	351.6
2000	936	339.4

Chart 3–10**Percent of All Deaths Due to Cardiovascular Diseases* by Ages, U.S., 1999**

The percent of deaths due to CVD increased with age among adults. In 1999, it was 20 percent at ages 35–44 and 53 percent at ages 85 and older.¹¹

Ages	Percent
<1	8.9
1–4	8.8
5–14	7.1
15–24	5.2
25–34	10.4
35–44	19.8
45–54	28.2
55–64	32.8
65–74	36.3
75–84	43.5
85+	52.9

* Includes congenital CVD.

Chart 3–11**Age-Adjusted Death Rates for Cardiovascular Diseases by State, U.S., 1996–98**

In 1996–98, CVD mortality was higher in the East than in the West.¹¹

Ranking	State	Deaths/100,000 Pop.
1	Mississippi	465.4
2	Tennessee	424.6
3	West Virginia	424.1
4	Oklahoma	419.9
5	Arkansas	413.4
6	Kentucky	410.4
7	Georgia	408.1
8	Alabama	408.0
9	South Carolina	406.7
10	Louisiana	402.6
11	Missouri	399.5
12	Michigan	388.8
13	Indiana	388.6
14	New York	388.6
15	Ohio	386.1
16	North Carolina	383.4
17	Nevada	379.9
18	Pennsylvania	379.6
19	Texas	371.6
20	Illinois	370.3
21	Virginia	369.1
22	Delaware	361.4
23	New Jersey	353.8
24	Maryland	351.3
25	New Hampshire	348.5
26	Maine	347.8
27	Nebraska	347.1
28	Iowa	346.9
29	Wisconsin	341.5
30	Kansas	341.0
31	Vermont	340.3
32	Rhode Island	340.0
33	California	339.5
34	Connecticut	338.7
35	South Dakota	332.6
36	Florida	332.4
37	Wyoming	326.5
38	North Dakota	325.1
39	Oregon	325.0
40	Washington	317.5
41	Massachusetts	315.4
42	Arizona	314.3
43	Idaho	313.7
44	Montana	310.9
45	Colorado	299.2
46	New Mexico	296.9
47	Alaska	296.6
48	Minnesota	290.1
49	Utah	290.0
50	Hawaii	289.4

Chart 3–12**Percent Decline in Age-Adjusted Death Rates for Cardiovascular Diseases by State, U.S., 1986–88 to 1996–98**

Between 1986–88 and 1996–98, the smallest average annual percent declines in CVD death rates tended to be in the South.¹¹

Ranking	State	Percent
1	Massachusetts	-28.2
2	Minnesota	-26.9
3	Utah	-26.3
4	New Jersey	-26.2
5	Alaska	-24.8
6	Maryland	-24.6
7	Illinois	-24.1
8	Delaware	-23.8
9	Michigan	-23.7
10	Maine	-23.6
11	Vermont	-23.5
12	Rhode Island	-22.5
13	Wisconsin	-22.2
14	South Dakota	-22.2
15	Idaho	-21.7
16	South Carolina	-21.7
17	Washington	-21.6
18	Pennsylvania	-21.6
19	California	-21.6
20	New Hampshire	-21.3
21	Colorado	-21.3
22	Oregon	-21.3
23	Ohio	-21.2
24	North Carolina	-20.8
25	Virginia	-20.5
26	New York	-20.4
27	Montana	-20.2
28	Louisiana	-19.8
29	Connecticut	-19.0
30	Indiana	-18.9
31	Florida	-18.9
32	Iowa	-18.0
33	Kansas	-17.6
34	Georgia	-17.5
35	Kentucky	-17.3
36	West Virginia	-17.2
37	Arizona	-17.1
38	Nevada	-16.8
39	North Dakota	-16.8
40	New Mexico	-16.6
41	Nebraska	-16.1
42	Alabama	-15.7
43	Wyoming	-15.2
44	Texas	-14.5
45	Arkansas	-13.4
46	Tennessee	-13.0
47	Missouri	-12.2
48	Hawaii	-11.5
49	Oklahoma	-10.4
50	Mississippi	-9.5

Total Heart Disease

Chart 3–13

Age-Adjusted Death Rates for Heart Disease by Race/Ethnicity and Sex, U.S., 1985–1999

Between 1985 and 1999, heart disease death rates declined appreciably in blacks, whites, and Hispanics, and more modestly in Asians and American Indians.²⁷

Male: Deaths/100,000 Population					
Year	Black	Non-Hispanic White	American Indian	Hispanic	Asian
1985	537.7	477.9	284.5	301.8	257.6
1986	526.6	465.6	279.0	294.5	252.9
1987	515.7	453.7	273.6	287.5	248.2
1988	505.1	442.0	268.4	280.6	243.6
1989	494.6	430.6	263.2	273.8	239.1
1990	484.4	419.5	258.1	267.2	234.7
1991	474.4	408.7	253.1	260.8	230.3
1992	464.6	398.2	248.2	254.6	226.0
1993	455.0	388.0	243.4	248.4	221.9
1994	445.6	378.0	238.7	242.5	217.8
1995	436.4	368.3	234.1	236.7	213.7
1996	427.4	358.8	229.6	231.0	209.8
1997	418.6	349.6	225.1	225.4	205.9
1998	409.9	340.6	220.8	220.0	202.1
1999	401.5	331.8	216.5	214.7	198.3

Female: Deaths/100,000 Population					
Year	Black	Non-Hispanic White	American Indian	Hispanic	Asian
1985	356.1	283.8	167.9	196.8	156.8
1986	350.8	278.4	165.5	192.5	154.2
1987	345.6	273.1	163.0	188.4	151.7
1988	340.4	267.9	160.7	184.3	149.2
1989	335.4	262.8	158.3	180.3	146.7
1990	330.4	257.8	156.0	176.4	144.3
1991	325.5	252.9	153.7	172.6	141.9
1992	320.7	248.1	151.5	168.9	139.6
1993	315.9	243.4	149.3	165.2	137.3
1994	311.2	238.7	147.1	161.7	135.0
1995	306.6	234.2	144.9	158.2	132.8
1996	302.0	229.7	142.8	154.8	130.6
1997	297.5	225.4	140.7	151.4	128.5
1998	293.1	221.1	138.7	148.2	126.4
1999	288.7	216.9	136.7	145.0	124.3

Note: Each line is a log linear regression derived from the actual rates.

Chart 3–14

Age-Adjusted Death Rates for Heart Disease by Race and Sex, U.S., 2000

In 2000, heart disease mortality was 48 percent higher in males than in females. Among males, it was 20 percent higher in blacks than in whites and among females, it was 34 percent higher in blacks than in whites.^{24, 26}

Race	Deaths/100,000 Population	
	Male	Female
Total	314.2	213.0
White	311.8	208.1
Black	375.7	279.4

Chart 3–15

Death Rates for Heart Disease by Age, Race, and Sex, U.S., 2000

Within sex groups, heart disease mortality was higher in blacks than in whites at all ages. Within race groups, it was higher in males than in females.^{24, 26}

Ages	Deaths/100,000 Population			
	White Male	White Female	Black Male	Black Female
35–44	36.2	13.0	71.9	39.3
45–54	129.0	39.8	248.3	124.6
55–64	354.9	140.8	642.2	324.6
65–74	891.3	452.0	1,208.4	790.1
75–84	2,216.1	1,485.8	2,474.8	1,972.6

Coronary Heart Disease

Chart 3–16

Prevalence* of Coronary Heart Disease by Race and Sex, Ages 25–74, U.S., 1971–74 to 1991–94

The prevalence of CHD increased in blacks between 1971–74 and 1991–94; it decreased in whites, males, and females between 1976–80 and 1991–94.¹⁴

Year	Percent of Population			
	White	Black	Male	Female
1971–74	4.80	5.04	5.32	4.40
1976–80	5.81	6.22	6.21	5.50
1988–91	5.33	6.75	6.16	4.84
1991–94	4.75	6.97	5.53	4.69

* Age-adjusted.

Chart 3–17

Prevalence of Acute Myocardial Infarction by Age and Sex, U.S., 1988–94

The prevalence of AMI was greater in males than in females at all ages.¹⁴

Ages	Percent of Population	
	Male	Female
25–34	0.5	0.1
35–44	0.8	0.3
45–54	5.0	1.2
55–64	10.7	4.4
65–74	15.5	7.2
75+	16.1	12.9

Chart 3–18**Prevalence of Acute Myocardial Infarction by Age and Race, U.S., 1988–94**

The prevalence of AMI was greater in blacks younger than 65, but higher in whites 65 and older.¹⁴

Ages	Percent of Population	
	Black	White
25–34	0.4	0.3
35–44	0.6	0.6
45–54	3.8	3.0
55–64	8.7	6.8
65–74	9.4	11.3
75+	11.8	14.4

Chart 3–19**Prevalence of Angina Pectoris by Age and Sex, U.S., 1988–94**

The prevalence of angina pectoris was greater in females between ages 25 and 74; after age 75, it was greater in males.¹⁴

Ages	Percent of Population	
	Male	Female
25–34	1.3	1.8
35–44	1.4	3.7
45–54	3.0	4.5
55–64	4.1	4.7
65–74	4.5	5.6
75+	6.1	5.5

Chart 3–20**Prevalence of Angina Pectoris by Age and Race, U.S., 1988–94**

The prevalence of angina pectoris was greater in blacks than in whites at all ages.¹⁴

Ages	Percent of Population	
	Black	White
25–34	3.4	1.3
35–44	3.6	2.6
45–54	5.4	3.5
55–64	5.5	4.3
65–74	6.4	5.1
75+	6.5	5.7

Chart 3–21**Hospitalization Rates for Acute Myocardial Infarction, Ages 45–64 and 65+, U.S., 1965–2000**

The AMI hospitalization rate for individuals ages 45–64 increased between 1965 and the mid-1970s; after that, it declined modestly. For individuals ages 65 and older, the rate increased from 1965 to its peak in 1986. Since then it has fluctuated.^{28–29}

Year	Hospitalizations/10,000 Population	
	Ages 45–64	Ages 65+
1965	42.9	98.5
1966	43.3	99.3
1967	45.5	93.5
1968	43.9	99.3
1969	48.4	110.6
1970	53.0	122.0
1971	52.4	119.5
1972	57.6	136.5
1973	53.9	132.0
1974	57.8	137.8
1975	63.9	131.1
1976	63.1	137.6
1977	61.9	136.5
1978	62.5	141.8
1979	56.7	122.4
1980	51.7	129.4
1981	57.9	141.6
1982	57.9	141.5
1983	56.4	139.6
1984	57.5	142.9
1985	59.5	152.7
1986	58.4	155.0
1987	61.5	145.0
1988	52.4	141.6
1989	52.3	143.3
1990	49.6	126.9
1991	48.8	133.5
1992	55.4	137.3
1993	50.5	136.0
1994	51.0	136.7
1995	49.1	140.5
1996	52.2	147.7
1997	47.1	133.5
1998	41.9	146.7
1999	46.4	148.6
2000	39.6	143.2

Chart 3–22**Hospital Case-Fatality Rates for Acute Myocardial Infarction, Ages 45–64 and 65+, U.S., 1970–2000**

Between 1970 and 2000, AMI hospital case-fatality rates declined substantially for individuals ages 45–64 and 65 and older.^{28–29}

Year	Percent Discharged Dead	
	Ages 45–64	Ages 65+
1970	16.0	37.8
1971	14.0	33.0
1972	11.9	32.6
1973	12.7	31.5
1974	10.3	29.6
1975	11.9	28.4
1976	12.1	25.7
1977	10.2	25.9
1978	9.7	28.2
1979	8.5	29.3
1980	8.4	26.6
1981	7.1	23.3
1982	10.0	27.6
1983	8.2	26.4
1984	7.7	22.4
1985	6.9	21.8
1986	7.6	21.0
1987	5.9	19.8
1988	7.4	18.0
1989	4.8	17.2
1990	5.0	17.6
1991	5.9	16.4
1992	3.8	15.7
1993	4.7	13.7
1994	3.8	14.3
1995	3.9	14.0
1996	4.5	14.7
1997	3.7	12.9
1998	3.8	13.6
1999	4.4	12.7
2000	5.8	12.5

Chart 3–23**Age-Adjusted Death Rates for Coronary Heart Disease, Actual and Expected, U.S., 1950–2000**

CHD accounted for 514,000 deaths in 2000. It would have accounted for 1,329,000 deaths if the rate had remained at its 1968 peak.^{11, 22–25}

Year	Deaths/100,000 Population		
	Actual Rate	Rate if Rise Continued	Peak Rate
1950	439.5		
1951	433.6		
1952	431.2		
1953	439.5		
1954	426.0		
1955	440.1		
1956	446.7		
1957	457.6		
1958	458.2		
1959	455.8		
1960	463.8		
1961	455.9		
1962	469.7		
1963	478.4		
1964	463.2		
1965	466.4		
1966	465.1		
1967	453.9		
1968	482.6		482.6
1969	469.8	469.8	482.6
1970	448.0	479.0	482.6
1971	448.5	481.4	482.6
1972	445.5	483.8	482.6
1973	437.0	486.2	482.6
1974	414.6	488.6	482.6
1975	388.1	491.1	482.6
1976	382.2	493.5	482.6
1977	368.5	496.0	482.6
1978	362.0	498.5	482.6
1979	339.1	501.0	482.6
1980	345.2	503.5	482.6
1981	329.5	506.0	482.6
1982	320.4	508.5	482.6
1983	316.1	511.0	482.6
1984	304.1	513.6	482.6
1985	296.2	516.2	482.6
1986	283.4	518.7	482.6
1987	273.9	521.3	482.6
1988	268.5	524.0	482.6
1989	257.5	526.6	482.6
1990	249.6	529.2	482.6
1991	241.5	531.8	482.6
1992	234.2	534.5	482.6
1993	234.6	537.2	482.6
1994	226.1	539.9	482.6
1995	221.9	542.6	482.6
1996	214.0	545.3	482.6
1997	205.6	548.0	482.6
1998	197.9	550.7	482.6
1999	195.7	553.5	482.6
2000	186.6	556.3	482.6

Note: Comparability ratio applied to rates for 1999–2000.

Chart 3–24**Age-Adjusted Death Rates for Coronary Heart Disease by Race and Sex, U.S., 1950–2000**

In the 1950s and 1960s, CHD death rates increased for blacks and white males; they were relatively stable for white females. Since then, the rates have declined appreciably.^{11, 22–26}

Year	Deaths/100,000 Population			
	White Male	White Female	Black Male*	Black Female*
1950	558.6	346.0	365.2	276.7
1951	555.9	338.0	365.7	269.0
1952	553.4	338.3	365.6	271.5
1953	558.2	342.3	386.8	278.2
1954	555.4	331.0	362.1	263.0
1955	568.7	343.4	372.9	274.0
1956	575.4	347.5	388.3	286.0
1957	589.0	355.8	410.8	297.8
1958	592.4	356.7	409.9	292.3
1959	590.7	355.0	407.1	284.1
1960	605.6	356.5	388.8	292.3
1961	598.2	348.0	420.5	305.2
1962	610.4	354.4	444.2	313.6
1963	624.5	359.8	461.9	318.5
1964	611.1	353.4	442.1	312.8
1965	613.9	358.6	419.3	303.0
1966	619.4	352.9	460.6	314.0
1967	608.4	343.7	441.8	301.3
1968	632.4	367.7	556.8	399.3
1969	619.5	357.2	539.5	381.3
1970	592.5	339.9	517.2	368.0
1971	596.7	340.0	511.2	357.3
1972	592.1	338.4	515.9	352.9
1973	584.4	329.8	510.4	355.5
1974	555.4	313.6	485.2	329.9
1975	525.5	291.2	452.7	304.5
1976	517.6	287.8	446.6	298.3
1977	500.2	275.9	441.6	296.2
1978	489.3	272.9	433.1	287.7
1979	462.1	255.4	397.3	255.8
1980	466.3	262.6	418.7	274.2
1981	447.5	250.2	396.2	258.2
1982	435.0	243.7	383.5	249.6
1983	427.3	241.1	383.6	254.7
1984	410.1	232.9	370.0	244.3
1985	399.3	226.4	367.9	241.0
1986	377.8	218.0	359.0	238.5
1987	363.4	211.5	352.1	232.4
1988	355.7	207.6	347.8	232.5
1989	339.5	198.5	345.1	228.4
1990	330.5	192.1	336.9	220.1
1991	318.4	185.7	331.1	218.7
1992	308.4	179.9	319.6	212.3
1993	307.8	180.3	323.2	217.4
1994	296.3	174.3	306.9	206.4
1995	288.4	171.4	307.0	205.4
1996	278.9	165.8	287.0	198.7
1997	267.1	159.1	279.7	191.7
1998	255.2	153.7	271.1	186.8
1999	249.6	152.6	272.7	192.7
2000	237.7	145.5	258.0	185.0

* Nonwhite from 1950–1967.

Chart 3–25**Deaths and Age-Adjusted Death Rates for Coronary Heart Disease, U.S., 1979–2000**

Since 1980, the number of deaths and the age-adjusted death rates for CHD have decreased almost every year.^{11, 22, 24}

Year	Deaths (Thousands)	Deaths/100,000 Population
1979	617	339.2
1980	636	345.2
1981	624	329.5
1982	621	320.4
1983	625	316.1
1984	613	304.1
1985	608	296.2
1986	593	283.4
1987	584	273.9
1988	582	268.5
1989	569	257.5
1990	558	249.6
1991	555	241.5
1992	549	234.2
1993	563	234.6
1994	553	226.1
1995	552	221.9
1996	545	214.0
1997	533	205.6
1998	527	197.9
1999	530	195.8
2000	514	186.6

Chart 3–26**Average Annual Percent Change in Age-Adjusted Death Rates for Coronary Heart Disease by Race and Sex, U.S., 1950–2000**

Since 1980, white males and females experienced steeper declines in CHD mortality than black males and females.^{11, 22–26}

Period	Total Pop.	White Male	White Female	Black Male	Black Female
1950–1960	0.7	0.9	0.6	1.2	0.8
1960–1970	-0.1	0.1	-0.1	2.8	2.4
1970–1980	-3.1	-2.8	-3.2	-2.7	-3.5
1980–1990	-3.1	-3.4	-3.0	-1.9	-1.8
1990–2000	-2.8	-3.2	-2.6	-2.6	-1.8

Chart 3–27**Average Annual Percent Change in Death Rates for Coronary Heart Disease by Age, Race, and Sex, U.S., 1990–1998**

Between 1990 and 1998, the average annual percent declines in CHD mortality ages 55 and older tended to be smaller with advancing age for white males and females and black females.¹¹

Ages	White Male	White Female	Black Male	Black Female
35–44	-3.0	0.1	-3.8	-1.0
45–54	-3.6	-3.0	-2.8	-3.1
55–64	-4.1	-3.4	-2.6	-3.5
65–74	-3.2	-2.8	-3.4	-2.4
75–84	-3.2	-3.0	-2.2	-1.6
85+	-2.3	-1.9	-2.4	-1.2

Chart 3–28**Age-Adjusted Death Rates for Coronary Heart Disease by Race and Sex, U.S., 2000**

In 2000, CHD mortality within sex groups was higher in blacks than in whites; it was considerably higher in males than in females.^{24, 26}

Sex	Deaths/100,000 Population		
	Total	White	Black
Male	236.8	237.5	257.8
Female	147.7	145.4	184.8

Chart 3–29**Death Rates for Coronary Heart Disease by Age, Race, and Sex, U.S., 2000**

In 2000, CHD mortality within sex groups was higher in blacks than in whites for all age groups. Death rates were also higher in males than in females.^{24, 26}

Ages	Deaths/100,000 Population			
	White Male	White Female	Black Male	Black Female
35–44	24.2	6.2	34.7	15.3
45–54	99.4	25.1	151.5	68.7
55–64	283.1	99.4	448.4	209.8
65–74	707.4	327.2	864.0	538.3
75–84	1,715.3	1,062.5	1,787.3	1,366.3

Chart 3–30**Age-Adjusted Death Rates for Coronary Heart Disease by State, U.S., 1996–98**

In 1996–98, high CHD death rates were in a narrow band of States from New York through Appalachia to Oklahoma. Many western Mountain States had low rates.¹¹

Rank	State	Deaths/100,000 Population
1	New York	259.9
2	Tennessee	244.3
3	West Virginia	242.2
4	Oklahoma	239.6
5	Mississippi	235.8
6	Michigan	228.3
7	Rhode Island	227.5
8	Missouri	225.8
9	Ohio	217.0
10	Kentucky	216.4
11	New Jersey	213.6
12	Pennsylvania	212.9
13	Iowa	212.8
14	Arkansas	211.8
15	Illinois	211.8
16	Delaware	211.4
17	Texas	210.8
18	Indiana	207.9
19	New Hampshire	207.6
20	Florida	206.9
21	Louisiana	206.4
22	North Carolina	204.0
23	California	203.8
24	South Carolina	202.8
25	Maryland	198.3
26	Maine	194.8
27	Vermont	192.6
28	Nevada	186.9
29	Georgia	186.3
30	South Dakota	184.8
31	Connecticut	183.0
32	Arizona	181.3
33	Wisconsin	180.6
34	Virginia	178.6
35	North Dakota	174.0
36	Alabama	173.3
37	Kansas	171.4
38	Wyoming	168.1
39	Massachusetts	167.5
40	Washington	166.1
41	New Mexico	165.3
42	Idaho	161.8
43	Oregon	159.4
44	Nebraska	159.1
45	Colorado	147.6
46	Montana	146.1
47	Minnesota	140.4
48	Alaska	134.2
49	Utah	133.3
50	Hawaii	128.4

Chart 3–31**Age-Adjusted Death Rates* for Coronary Heart Disease by Country and Sex, Ages 35–74, 1999**

In 1999, among 15 industrialized countries, the United States ranked seventh highest for CHD mortality in males and fifth in females.⁸

Country	Deaths/100,000 Population	
	Male	Female
HUN	419.8	160.5
ROM	354.5	166.8
CZR	317.6	115.3
SCO (00)	291.4	111.5
POL	291.0	90.8
FIN	276.4	69.6
USA	229.9	95.4
NOR (98)	203.4	57.1
GER	190.0	64.2
SWE (98)	189.7	58.6
DEN (98)	173.7	63.2
AUL	160.9	53.9
NTH	151.1	50.9
JPN	56.7	18.9
KOR	52.7	21.2

* Age-adjusted to European standard.

Note: Data for 1999 unless otherwise noted in parentheses.

Chart 3–32**Change in Age-Adjusted Death Rates* for Coronary Heart Disease in Males by Country, Ages 35–74, 1990–1999**

Between 1990 and 1999 (or latest data year), nine countries had a steeper decline in CHD mortality in males than the United States.⁸

Country	Percent Change**
DEN*** (96)	-6.62
AUL (97)	-5.63
NOR (95)	-5.61
FIN (95)	-5.18
SCO (99)	-4.71
SWE (96)	-4.70
NTH (95)	-4.44
CZR (93)	-4.38
POL (96)	-4.26
USA (98)	-3.48
GER (97)	-2.99
JPN (94)	-0.55
HUN (95)	0.92
ROM (98)	3.43
KOR (94)	12.35

* Age-adjusted to the European standard.

** Based on a log linear regression of the actual rates.

*** Eighth revision of the ICD.

Note: The latest data years are indicated in parentheses.

Chart 3–33

Change in Age-Adjusted Death Rates* for Coronary Heart Disease in Females by Country, Ages 35–74, 1990–1999

Between 1990 and 1999, seven countries had a steeper decline in CHD mortality in females than the United States.⁸

Country	Percent Change**
AUL (97)	-6.63
FIN (95)	-5.55
SCO (99)	-5.54
DEN*** (96)	-5.24
SWE (96)	-4.81
CZR (93)	-4.73
NOR (95)	-4.72
USA (98)	-2.90
POL (96)	-2.88
NTH (95)	-2.65
JPN (94)	-2.10
GER (97)	-1.83
HUN (95)	1.15
ROM (98)	3.39
KOR (94)	10.0

* Age-adjusted to the European standard.

** Based on a log linear regression of the actual rates.

*** Eighth revision of the ICD.

Note: The latest data years are indicated in parentheses.

Congestive Heart Failure

Chart 3–34

Prevalence* of Congestive Heart Failure by Race and Sex, Ages 25–74, U.S., 1971–74 to 1991–94

Between 1976–80 and 1988–91, the prevalence of CHF increased substantially in each group: male and female, black and white.¹⁴

Years	Percent of Population			
	White	Black	Male	Female
1971–74	0.93	1.34	0.96	0.97
1976–80	0.84	1.01	1.08	0.68
1988–91	1.86	2.72	2.32	1.54
1991–94	1.44	2.72	1.87	1.54

* Age-adjusted.

Chart 3–35**Hospitalization Rates for Congestive Heart Failure, Ages 45–64 and 65+, U.S., 1971–2000**

Between 1971 and 2000, CHF hospitalization rates more than tripled for individuals ages 45–64 and 65 and older.^{28–29}

Year	Hospitalizations/10,000 Population	
	Ages 45–64	Ages 65+
1971	9.5	60.1
1972	11.3	73.3
1973	12.0	78.2
1974	12.8	82.7
1975	13.2	88.3
1976	13.7	97.3
1977	14.2	106.4
1978	14.9	112.5
1979	15.5	127.7
1980	14.3	133.5
1981	15.6	130.8
1982	16.2	132.6
1983	20.1	132.7
1984	20.6	151.7
1985	21.4	156.3
1986	23.1	158.2
1987	22.7	161.8
1988	24.4	175.5
1989	25.6	168.5
1990	26.0	182.0
1991	27.0	193.6
1992	31.5	206.4
1993	34.1	207.6
1994	29.8	210.0
1995	27.2	208.0
1996	28.5	202.7
1997	31.3	223.2
1998	30.6	226.7
1999	29.4	221.1
2000	31.9	220.2

Chart 3–36**Hospital Case-Fatality Rates for Congestive Heart Failure, Ages <65 and 65+, U.S., 1981–2000**

The percent of CHF hospital discharges that were discharged dead declined during the 1981–2000 period for individuals younger than 65 and ages 65 and older.^{28–29}

Year	Percent Discharged Dead	
	Ages <65	Ages 65+
1981		11.6
1982	4.5	10.5
1983	5.9	10.7
1984	5.2	9.8
1985	4.5	9.0
1986	3.7	9.9
1987	4.6	7.9
1988	5.4	9.3
1989	4.1	7.6
1990	4.0	8.1
1991	3.9	8.9
1992	2.7	8.0
1993	2.6	7.2
1994	2.2	7.1
1995	3.4	5.0
1996	3.3	5.4
1997	1.6	5.6
1998	2.3	4.8
1999	1.3	6.0
2000	1.5	5.0

Chart 3–37**Age-Adjusted Death Rates for Congestive Heart Failure by Race and Sex, U.S., 1979–1999**

In the 1990s, CHF death rates for whites and blacks leveled off after steady increases.^{11, 23–25}

Year	Deaths/100,000 Population			
	White Male	White Female	Black Male	Black Female
1979	16.9	12.0	22.4	17.2
1980	18.2	13.1	24.4	19.1
1981	18.7	13.7	23.8	18.1
1982	19.4	14.3	23.8	18.7
1983	20.2	15.2	24.8	19.4
1984	20.9	15.9	26.3	20.9
1985	21.3	16.9	27.0	21.8
1986	22.6	17.6	27.2	23.2
1987	22.3	18.0	26.7	21.5
1988	22.9	18.4	27.4	22.4
1989	19.7	16.4	23.8	20.8
1990	19.3	16.0	24.5	19.3
1991	19.2	16.2	22.7	19.3
1992	19.1	16.3	22.0	18.8
1993	21.1	18.1	23.7	20.5
1994	20.5	17.7	22.5	18.9
1995	20.4	17.9	22.9	19.2
1996	20.4	17.7	22.3	19.2
1997	20.4	18.1	21.4	19.5
1998	18.6	17.1	20.3	18.0
1999	20.2	18.5	23.4	20.6

Note: The break in the trend lines is intended to signal a discrepancy arising from the adoption of new cause-of-death coding instructions on death certificates in 1989.

Chart 3–38**Age-Adjusted Death Rates for Congestive Heart Failure by Race and Sex, U.S., 1999**

In 1999, death rates for CHF within sex groups were slightly higher in blacks than in whites; they were relatively similar in males and females.¹¹

Race	Deaths/100,000 Population	
	Male	Female
Total	21.0	19.5
White	21.0	19.3
Black	24.4	21.4

Chart 3–39**Death Rates for Congestive Heart Failure by Age, Race, and Sex, U.S., 1999**

In 1999, CHF mortality was higher in blacks than in whites at all ages. Within race groups, it was higher in males than in females.¹¹

Ages	Deaths/100,000 Population			
	White Male	White Female	Black Male	Black Female
35–44	0.60	0.34	1.92	1.47
45–54	2.15	1.22	8.80	4.76
55–64	10.00	6.34	23.95	15.63
65–74	41.97	28.39	62.61	49.85
75–84	150.49	128.84	174.62	161.75

Chart 3–40**Age-Adjusted Death Rates* for Heart Failure by Country and Sex, Ages 35–74, 1999**

In 1999, the United States ranked ninth highest for heart failure mortality in males and seventh highest for females.⁸

Country	Percent Change	
	Male	Female
POL	52.44	24.09
CZR	22.29	9.70
JPN	21.73	10.45
GER	21.59	12.49
NTH	14.28	8.00
DEN (98)	11.83	6.20
NOR (98)	10.51	4.09
KOR	10.39	7.35
USA	10.25	6.91
HUN	8.66	3.54
SWE (98)	6.29	3.47
SCO (00)	6.02	2.60
AUL	3.86	2.56
FIN	1.38	1.25
ROM	1.30	1.08

* Age-adjusted to European standard.

Note: Data for 1999 unless otherwise noted in parentheses.

Cardiomyopathy

Chart 3–41

Age-Adjusted Death Rates for Cardiomyopathy by Race and Sex, U.S., 1999

In 1999, the cardiomyopathy death rate was approximately twice as high in blacks as in whites. It was also approximately twice as high in males as in females.¹¹

Race	Deaths/100,000 Population	
	Male	Female
Total	13.84	7.19
White	12.69	6.54
Black	25.72	13.12

Chart 3–42

Death Rates for Cardiomyopathy by Age, Race, and Sex, U.S., 1999

In 1999, within sex groups, cardiomyopathy mortality was higher in blacks than in whites at each age; within race groups, it was higher in males than in females.¹¹

Ages	Deaths/100,000 Population			
	White Male	White Female	Black Male	Black Female
35–44	3.97	1.39	14.40	6.27
45–54	7.76	3.01	29.26	12.08
55–64	16.61	7.42	54.40	21.65
65–74	40.48	18.70	78.58	37.69
75–84	81.53	43.67	114.61	75.57

Atrial Fibrillation

Chart 3–43

Hospitalizations for Atrial Fibrillation, U.S., 1982–1999

Between 1982 and 1999, hospitalizations with atrial fibrillation as a primary or secondary diagnosis increased.^{28–29}

Year	Number (Thousands)	
	Primary	Secondary
1982	115	429
1983	115	473
1984	111	553
1985	142	612
1986	150	693
1987	146	749
1988	171	820
1989	162	888
1990	181	922
1991	210	1,031
1992	227	1,133
1993	240	1,215
1994	277	1,309
1995	270	1,348
1996	286	1,528
1997	319	1,692
1998	327	1,774
1999	347	1,872

Chart 3–44

Hospitalization Rates for Atrial Fibrillation by Age, U.S., 1982–1999

Between 1982 and 1999, the hospitalization rate for atrial fibrillation in patients ages 45–65 increased more than 80 percent; it more than doubled for those ages 65 and older.^{28–29}

Year	Hospitalizations/10,000 Population	
	Ages 45–64	Ages 65+
1982	6.8	28.3
1983	7.0	27.4
1984	6.3	26.7
1985	8.7	34.0
1986	8.2	37.0
1987	6.8	35.9
1988	8.5	40.2
1989	8.4	36.8
1990	9.6	40.2
1991	10.1	47.9
1992	10.4	51.1
1993	9.9	54.3
1994	10.6	62.4
1995	10.5	60.5
1996	11.4	62.3
1997	11.6	70.5
1998	13.5	68.6
1999	12.4	74.2

Cerebrovascular Diseases (Stroke)

Chart 3–45

Prevalence of Stroke, Ages 25–74, U.S., 1971–74 to 1991–94

Between 1971–74 and 1991–94, the prevalence of stroke increased in males and females and in blacks and whites.¹⁴

Years	Percent of Population			
	White	Black	Male	Female
1971–74	1.2	2.0	1.3	1.2
1976–80	1.3	2.0	1.4	1.2
1988–91	1.3	1.9	1.6	1.1
1991–94	1.6	2.6	2.0	1.5

Chart 3–46

Prevalence of Stroke by Age and Sex, U.S., 1988–94

In 1988–94, the prevalence of stroke was higher in males than in females at all ages.¹⁴

Ages	Percent of Population	
	Male	Female
35–44	0.5	0.4
45–54	2.2	1.0
55–64	4.0	2.7
65–74	5.9	5.8
75+	12.5	10.7

Chart 3–47**Prevalence of Stroke by Age and Race, U.S., 1988–94**

In 1988–94, the prevalence of stroke was higher in blacks than in whites at all ages.¹⁴

Ages	Percent of Population	
	Black	White
35–44	0.6	0.5
45–54	2.1	1.6
55–64	4.6	3.3
65–74	10.1	5.5
75+	15.8	10.8

Chart 3–48**Hospitalization Rates for Stroke, Ages 45–64 and 65+, U.S., 1971–2000**

Hospitalization rates for stroke in patients ages 45–64 and 65 and older increased between 1971 and the mid-1980s; no clear trend followed to 2000.^{28–29}

Year	Hospitalizations/10,000 Population	
	Ages 45–64	Ages 65+
1971	30.1	192.6
1972	34.8	207.1
1973	35.0	211.0
1974	35.2	214.9
1975	34.8	202.1
1976	33.9	207.3
1977	34.8	204.8
1978	35.4	204.1
1979	37.4	237.1
1980	38.5	231.6
1981	39.7	226.2
1982	40.6	230.1
1983	41.5	234.1
1984	42.9	237.8
1985	42.9	240.3
1986	39.5	231.0
1987	42.3	223.0
1988	37.2	190.4
1989	33.6	192.6
1990	33.2	193.1
1991	33.5	201.5
1992	35.6	193.6
1993	34.7	192.0
1994	35.1	204.4
1995	34.8	209.8
1996	34.8	214.7
1997	36.5	228.6
1998	38.2	218.7
1999	36.3	205.5
2000	37.4	204.1

Chart 3–49**Hospital Case-Fatality Rate for Stroke, Ages <65 and 65+, U.S., 1971–2000**

Hospital case-fatality rates for stroke in both groups declined appreciably between 1971 and the mid-1980s and modestly thereafter.^{28–29}

Year	Percent Discharged Dead	
	Ages <65	Ages 65+
1971	17.7	20.1
1972	16.7	20.8
1973	15.2	20.2
1974	13.4	16.9
1975	12.9	17.8
1976		
1977		
1978	11.3	15.5
1979	9.5	14.0
1980		
1981	9.6	11.5
1982		
1983	5.9	10.7
1984		
1985	6.2	9.5
1986	6.9	9.9
1987	7.2	9.8
1988	5.9	11.1
1989	5.2	9.1
1990	6.0	8.9
1991	6.1	8.9
1992	7.4	7.3
1993	5.4	7.8
1994	5.9	7.2
1995	5.9	7.7
1996	4.9	7.0
1997	6.3	6.2
1998	6.1	6.6
1999	5.4	7.6
2000	5.8	6.6

Chart 3–50**Age-Adjusted Death Rates for Stroke by Race and Sex, U.S., 1950–2000**

The steep decline in stroke mortality that occurred for all four groups in the 1970s slowed in the 1980s and 1990s.^{11, 22–26}

Year	Deaths/100,000 Population			
	White Male	White Female	Black Male*	Black Female*
1950	182.1	169.7	231.3	240.6
1951	180.7	172.1	230.3	237.3
1952	180.1	170.0	233.7	235.0
1953	178.7	169.9	226.5	228.6
1954	173.0	163.9	221.1	223.7
1955	178.8	167.0	222.8	221.9
1956	178.8	166.9	221.8	225.0
1957	185.4	171.1	231.8	231.5
1958	184.3	172.0	237.7	229.3
1959	181.6	167.2	227.2	229.2
1960	181.6	164.9	230.4	225.2
1961	176.7	160.6	219.7	219.5
1962	178.7	161.6	229.0	225.5
1963	179.1	160.7	234.1	222.0
1964	171.9	153.5	220.5	209.6
1965	171.8	152.3	222.9	210.1
1966	171.2	152.0	222.0	205.0
1967	166.5	145.9	206.5	190.6
1968	169.2	148.4	232.8	208.9
1969	162.4	141.9	221.7	197.2
1970	153.7	135.5	206.4	189.3
1971	156.6	134.3	200.4	179.7
1972	156.2	134.2	200.8	178.8
1973	151.7	133.6	197.6	175.7
1974	144.1	125.9	184.6	160.6
1975	130.9	113.3	167.8	145.1
1976	123.3	108.3	162.3	138.2
1977	116.1	101.4	153.1	132.4
1978	107.8	95.8	145.7	124.4
1979	100.4	89.9	139.7	117.5
1980	99.0	89.2	142.1	119.8
1981	91.5	83.3	132.2	112.7
1982	86.3	78.2	123.9	105.9
1983	83.5	75.0	118.2	104.4
1984	80.4	73.1	115.1	100.3
1985	77.4	70.9	112.7	99.4
1986	73.7	68.1	110.7	93.5
1987	72.0	66.7	108.3	91.6
1988	71.6	65.0	109.6	92.6
1989	67.3	61.7	104.2	89.6
1990	65.7	60.5	102.5	84.0
1991	63.5	58.3	100.8	81.4
1992	62.6	57.3	95.0	79.4
1993	63.9	58.3	95.9	79.8
1994	63.4	58.5	96.1	79.9
1995	63.2	59.5	96.7	81.0
1996	62.7	59.0	93.3	79.0
1997	61.5	57.9	88.5	76.1
1998	57.5	56.6	84.6	74.2
1999	56.7	55.4	82.5	73.8
2000	54.7	54.2	80.9	72.6

* Nonwhite from 1950 to 1967.

Chart 3–51**Deaths and Age-Adjusted Death Rates for Stroke, U.S., 1979–2000**

Between 1979 and the early 1990s, the number of deaths and the age-adjusted death rates for stroke declined. The number of deaths remained relatively stable after the mid-1990s, while the adjusted rates continued to drop.^{11, 22, 24}

Year	Deaths (Thousands)	Deaths/100,000 Population
1979	169	97.3
1980	170	96.4
1981	164	89.7
1982	158	84.4
1983	156	81.4
1984	154	79.0
1985	153	76.6
1986	150	73.3
1987	150	71.8
1988	151	70.8
1989	147	67.1
1990	144	65.5
1991	143	63.3
1992	144	62.1
1993	150	63.2
1994	153	63.3
1995	158	63.9
1996	160	63.2
1997	160	61.8
1998	158	59.5
1999	158	58.4
2000	157	56.8

Chart 3–52**Age-Adjusted Death Rates for Stroke by Race/Ethnicity and Sex, U.S., 1985–1999**

Between 1985 and 1999, stroke mortality declined for all groups. The decrease was modest among Asian males and American Indian females.²⁷

Male: Deaths/100,000 Population					
Year	Black	White*	American Indian	Hispanic	Asian
1985	114.3	74.6	49.4	55.3	65.6
1986	111.9	73.2	48.4	54.2	65.2
1987	109.6	72.0	47.5	53.2	64.7
1988	107.3	70.7	46.6	52.2	64.2
1989	105.1	69.5	45.7	51.2	63.8
1990	102.9	68.3	44.9	50.2	63.3
1991	100.8	67.1	44.0	49.3	62.9
1992	98.7	65.9	43.2	48.3	62.4
1993	96.6	64.7	42.4	47.4	62.0
1994	94.6	63.6	41.6	46.5	61.5
1995	92.7	62.5	40.8	45.6	61.1
1996	90.7	61.4	40.0	44.7	60.6
1997	88.9	60.3	39.3	43.9	60.2
1998	87.0	59.3	38.5	43.1	59.8
1999	85.2	58.2	37.8	42.2	59.3

Female: Deaths/100,000 Population					
Year	Black	White*	American Indian	Hispanic	Asian
1985	97.1	68.3	43.5	48.5	57.1
1986	95.2	67.4	43.1	47.4	56.3
1987	93.3	66.5	42.7	46.4	55.6
1988	91.5	65.6	42.3	45.3	54.9
1989	89.7	64.7	41.9	44.3	54.2
1990	88.0	63.8	41.5	43.3	53.4
1991	86.3	63.0	41.2	42.3	52.7
1992	84.6	62.1	40.8	41.4	52.0
1993	82.9	61.3	40.4	40.5	51.4
1994	81.3	60.4	40.1	39.5	50.7
1995	79.7	59.6	39.7	38.7	50.0
1996	78.2	58.8	39.3	37.8	49.4
1997	76.6	58.0	39.0	36.9	48.7
1998	75.2	57.2	38.6	36.1	48.1
1999	73.7	56.5	38.3	35.3	47.4

* Non-Hispanic.

Note: Each line is a log linear regression derived from the actual rates.

Chart 3–53

Average Annual Percent Change in Age-Adjusted Death Rates for Stroke by Race and Sex, U.S., 1960–2000

The steep declines in stroke mortality that occurred in males and females and in whites and blacks during the 1970s and 1980s were followed by modest changes from 1990 to 1995 and appreciable declines from 1995 to 2000.^{11, 22–26}

Period	Total Population	White Male	White Female	Black Male	Black Female
1960–1965	-1.3	-1.0	-1.5	-0.4	-1.4
1965–1970	-2.2	-2.0	-2.2	-0.8	-1.5
1970–1975	-3.2	-3.0	-3.1	-3.6	-4.7
1975–1980	-5.2	-5.8	-5.0	-3.7	-4.2
1980–1985	-4.4	-4.6	-4.4	-4.5	-3.6
1985–1990	-3.0	-3.1	-3.1	-1.8	-2.7
1990–1995	-0.3	-0.5	-0.2	-1.2	-0.7
1995–2000	-2.4	-3.1	-1.9	-3.7	-2.2

Chart 3–54

Age-Adjusted Death Rates for Stroke by Race and Sex, U.S., 2000

In 2000, stroke mortality was appreciably higher in blacks than in whites and about the same in males and females.^{24, 26}

Race	Deaths/100,000 Population	
	Male	Female
Total	60.3	59.2
White	57.9	57.4
Black	85.6	76.8

Chart 3–55

Death Rates for Stroke by Age, Race, and Sex, U.S., 2000

In 2000, stroke mortality was higher in blacks than in whites at all ages. Within race groups, it was higher in males than in females.^{24, 26}

Ages	Deaths/100,000 Population			
	White Male	White Female	Black Male	Black Female
35–44	4.4	4.5	14.3	13.7
45–54	13.4	11.2	49.9	38.4
55–64	39.7	29.9	118.6	74.6
65–74	134.3	108.5	256.3	187.9
75–84	465.4	440.1	632.4	563.1

Chart 3–56**Age-Adjusted Death Rates for Stroke by State, U.S., 1996–98**

In 1996–98, stroke mortality was highest in many of the southeastern States, most of which comprise “the stroke belt”; Indiana; and the northern Pacific States.¹¹

Rank	State	Deaths/100,000
1	South Carolina	86.0
2	Arkansas	85.4
3	Tennessee	78.3
4	North Carolina	77.8
5	Oregon	77.2
6	Georgia	73.8
7	Mississippi	69.9
8	Virginia	69.3
9	Indiana	68.8
10	Alabama	68.1
11	Washington	68.1
12	Oklahoma	68.0
13	Kentucky	67.6
14	Louisiana	67.2
15	Texas	66.3
16	Wisconsin	66.3
17	Idaho	65.1
18	Missouri	64.5
19	Wyoming	63.9
20	Alaska	63.7
21	Nevada	63.0
22	Michigan	62.7
23	Illinois	62.3
24	Kansas	62.0
25	California	61.5
26	North Dakota	61.5
27	Minnesota	61.4
28	Iowa	61.1
29	New Hampshire	61.0
30	Utah	60.9
31	Montana	60.6
32	South Dakota	60.5
33	Ohio	60.2
34	Maryland	60.0
35	Nebraska	59.6
36	West Virginia	59.6
37	Hawaii	58.9
38	Pennsylvania	58.9
39	Vermont	58.4
40	Maine	57.0
41	Colorado	56.5
42	Arizona	56.2
43	New Mexico	53.1
44	Connecticut	52.1
45	Delaware	51.8
46	Florida	51.3
47	Rhode Island	51.2
48	New Jersey	50.1
49	Massachusetts	49.3
50	New York	42.9

Chart 3–57**Age-Adjusted Death Rates* for Stroke by Country and Sex, Ages 35–74, 1999****

In 1999, among 15 industrialized countries, the United States had one of the lowest death rates for stroke. Eastern European countries and Korea had markedly higher rates compared with other countries.⁸

Country	Deaths/100,000 Population	
	Male	Female
ROM	281.5	186.4
HUN	206.8	110.7
KOR	162.2	99.6
POL	137.7	85.4
CZR	119.7	70.8
JPN	76.8	37.6
FIN	71.2	36.9
SCO (00)	70.3	52.9
DEN (98)	55.5	40.2
GER	52.7	32.0
SWE (98)	52.3	31.0
NOR (98)	50.6	34.0
NTH	45.8	34.9
USA	41.0	32.5
AUL	35.3	25.0

* Age-adjusted to the European standard.

** Data for 1999 unless otherwise noted in parentheses.

Chart 3–58**Change in Age-Adjusted Death Rates* for Stroke in Males by Country, Ages 35–74, 1990–1999**

Between 1990 and 1999, 11 countries had greater percent declines in stroke mortality for males than the United States.⁸

Country	Percent Change**
CZR (93)	-8.01
FIN (95)	-4.60
SCO (99)	-4.16
JPN (94)	-3.98
AUL (97)	-3.83
NOR (95)	-2.99
SWE (96)	-2.64
GER (97)	-2.62
KOR (94)	-2.04
DEN*** (96)	-1.13
NTH (95)	-1.12
USA (98)	-1.06
POL (96)	-0.06
HUN (95)	-0.03
ROM (98)	6.23

* Age-adjusted to the European standard.

** Based on a log linear regression of the actual rates.

*** Eighth revision of the ICD.

Note: The latest data years are indicated in parentheses.

Chart 3–59

Change in Age-Adjusted Death Rates* for Stroke in Females by Country, Ages 35–74, 1990–1999

Between 1990 and 1999, 10 countries had greater percent declines in stroke mortality for females than the United States.⁸

Country	Percent Change**
CZR (93)	-7.92
SCO (99)	-4.65
AUL (97)	-4.30
JPN (94)	-3.87
FIN (95)	-3.87
GER (97)	-2.65
DEN*** (96)	-2.51
NOR (95)	-2.27
SWE (96)	-2.17
HUN (95)	-1.16
USA (98)	-0.88
NTH (95)	-0.61
POL (96)	0.51
KOR (94)	3.40
ROM (98)	4.35

* Age-adjusted to the European standard.

** Based on a log linear regression of the actual rates.

*** Eighth revision of the ICD.

Note: The latest data years are indicated in parentheses.

Hypertension

Chart 3–60

Prevalence of Hypertension by Age, U.S., 1988–94

In 1988–94, the prevalence of hypertension was 38 percent at ages 50–59 and 71 percent at ages 80 and older.¹⁴

Ages	Percent of Population
18–29	3
30–39	9
40–49	18
50–59	38
60–69	51
70–79	66
80+	71

Note: Hypertension is defined as systolic BP 140+ mmHg, or 90+ diastolic BP, or on medication.

Chart 3–61

Prevalence of Hypertension by Race/Ethnicity and Sex, Ages 20–74, U.S., 1988–94

In 1988–94, the prevalence of hypertension at ages 20–74 was appreciably higher in blacks than in whites or Mexican-Americans. Within race groups, it was higher in males than in females for whites and Mexican-Americans, but similar for black males and females.²⁷

Race	Percent of Population	
	Male	Female
Black	36.4	36.9
White	25.5	19.7
Mexican-American	25.9	22.3

Note: Hypertension is defined as systolic BP 140+ mmHg, or 90+ diastolic BP, or on medication.

Chart 3–62**Prevalence* of Hypertension by Race/Ethnicity and Sex, Ages 20–74, U.S., 1960–62 to 1988–94**

The prevalence of hypertension was appreciably lower in 1988–94 compared with earlier years for white and black males and females but not for Mexican-Americans, who had the lowest prevalence.¹⁴

Years	Percent of Population					
	White Male	White Female	Black Male	Black Female	Mexican-American Male	Mexican-American Female
1960–62	40.5	32.8	49.7	53.5		
1971–74	43.1	33.6	55.0	53.1		
1976–80	44.8	33.9	50.7	50.6	25.6	22.5
1988–94	25.5	19.7	36.4	35.9	25.9	22.3

* Age-adjusted.

Note: Hypertension is defined as systolic BP 140+ mmHg, or 90+ diastolic BP, or on medication.

Chart 3–63**Hypertensive Population Aware, Treated, and Controlled, Ages 18–74, U.S., 1971–72 to 1988–94**

Eighty-eight percent of persons with a high level of hypertension were aware of their condition in 1988–94 compared with 51 percent in 1971–72. The percent of hypertensive persons treated and controlled increased from 16 percent in 1971–72 to 65 percent in 1988–94.¹⁴

Years	Percent of Hypertensive Population			
	Unaware	On Medication Controlled	On Medication Uncontrolled	No Medication Uncontrolled
1971–72	49	16	20	15
1974–75	36	20	14	30
1976–80	27	34	12	27
1988–94	12	65	14	9

Note: Hypertension is defined as systolic BP 140+ mmHg, or 90+ diastolic BP, or on medication.

Chart 3–64**Hypertensive Population Aware, Treated, and Controlled, Ages 18–74, U.S., 1976–80, 1988–91, and 1991–94**

In 1988–91, 73 percent of hypertensive patients were aware of their condition, 55 percent were receiving treatment for it, and 29 percent had it controlled. Those percentages were appreciably greater than the comparable figures for the 1976–80 period and remained relatively stable for 1991–94.³⁹

	Percent of Hypertensive Population		
	1976–80	1988–91	1991–94
Awareness	51	73	68.4
Treatment	31	55	53.6
Control	10	29	27.4

Note: Hypertension is defined as systolic BP 140+ mmHg, or 90+ diastolic BP, or on medication.

Diseases of Arteries

Chart 3–65

Age-Adjusted Death Rates for Diseases of Arteries by Race and Sex, U.S., 2000

In 2000, death rates for diseases of arteries were higher in males than in females, and about the same in blacks as in whites.^{24, 26}

Race	Deaths/100,000 Population	
	Male	Female
Total	17.9	12.2
White	18.2	12.0
Black	17.2	14.2

Chart 3–66

Death Rates for Diseases of Arteries by Age, Race, and Sex, U.S., 2000

In 2000, death rates for diseases of arteries within race groups were higher in males than in females at all ages. For females, they were higher in blacks than in whites at all ages, but only below age 65 were they higher in black males than in white males.^{24, 26}

Ages	Deaths/100,000 Population			
	White Male	White Female	Black Male	Black Female
35–44	1.1	0.6	2.8	1.8
45–54	4.0	1.7	8.7	4.6
55–64	15.1	6.3	22.6	14.0
65–74	57.1	27.8	47.6	34.7
75–84	141.2	89.1	128.2	102.7

Congenital Anomalies of the Circulatory System

Chart 3–67

Percent of Deaths From Congenital Anomalies of the Circulatory System, Age <1, U.S., 1940–1999

The percentage of deaths from congenital anomalies of the circulatory system, younger than 1 year of age, declined from 82 percent in 1940 to 41 percent in 1999.^{11, 23}

Year	Percent of Deaths
1940	82.0
1950	75.1
1960	67.3
1970	63.7
1980	57.5
1990	53.3
1993	48.9
1994	49.6
1995	45.8
1996	47.1
1997	44.5
1998	44.7
1999	41.0

Chart 3–68**Infant Mortality From Congenital Anomalies of the Circulatory System by Race, U.S., 1970–1999**

Infant congenital heart disease mortality declined in the 1970s and 1980s in blacks and in whites. For other congenital anomalies of the circulatory system, the trend has been downwards only since the early 1980s.^{11, 23}

Year	Deaths/100,000 Live Births			
	Heart White	Heart Black	Other CVD White	Other CVD Black
1970	120.2	113.4	19.8	19.8
1971	114.2	105.2	22.4	20.9
1972	114.7	106.5	16.1	17.9
1973	107.8	103.3	20.7	19.6
1974	100.0	100.1	19.6	22.1
1975	96.6	92.3	21.9	24.0
1976	91.5	87.6	21.0	25.5
1977	90.6	84.6	22.0	27.4
1978	85.2	83.6	23.6	33.0
1979	83.3	80.3	22.8	32.5
1980	80.3	78.9	24.5	34.4
1981	74.2	73.7	22.7	37.8
1982	77.1	76.6	21.7	39.7
1983	70.3	74.1	23.6	36.9
1984	69.8	74.9	20.3	32.1
1985	69.2	72.7	17.4	25.6
1986	65.1	69.2	14.5	25.4
1987	62.0	71.4	14.5	21.7
1988	67.7	64.6	14.0	20.5
1989	62.1	71.2	11.1	18.4
1990	61.3	72.2	11.4	16.7
1991	56.3	70.3	10.7	17.7
1992	55.0	71.8	10.1	15.3
1993	54.0	64.7	9.6	14.6
1994	53.4	62.1	9.5	16.0
1995	50.1	58.5	7.7	10.1
1996	48.7	58.5	8.5	11.4
1997	45.2	51.3	7.9	11.3
1998	44.5	51.3	7.2	12.3
1999	40.0	47.9	4.9	9.4

4. Lung Diseases

The term *lung diseases* is used here to mean:

- Acute lower respiratory infections
- Chronic lower respiratory diseases
- Lung diseases due to external agents
- Adult respiratory distress syndrome (RDS)
- Pulmonary edema
- Interstitial lung diseases
- Cardiopulmonary diseases
- HIV infections related to pulmonary disease
- Neonatal pulmonary diseases.

Chart 4–1 shows the distribution of deaths in 1999 by major lung subgroups. Chart 4–2 contains a detailed list of lung diseases; their 9th revision ICD codes; 1999 estimates of hospital discharges, length of stay, and physician office visits for the diagnostic codes; 10th revision ICD codes for lung diseases; and number of deaths in 1999 for those codes. Subsequent charts display morbidity and mortality for total lung diseases and specific subgroups—chronic bronchitis, emphysema, COPD, asthma, neonatal RDS, and sudden infant death syndrome (SIDS).

Chronic Obstructive Pulmonary Disease

The term *COPD* includes chronic bronchitis and emphysema. In 1997, the survey used to determine the prevalence of chronic bronchitis and emphysema in the United States changed. Prior to 1997, prevalence was based on individuals who had, or knew someone in the family who had, chronic bronchitis or emphysema during the past 12 months. The new survey asks, “During the past 12 months, have you been told by a doctor or other health professional that you have chronic bronchitis? Have you ever been told by a doctor or other health professional that you have emphysema?” As a result, the 1997 to 2000 estimates are not comparable to those based on the NHIS of 1996 and earlier. A break in the prevalence trend lines between 1996 and 1997 in Charts 4–5 and 4–7 is used to indicate the discontinuity.

Asthma

Asthma mortality declined between 1968 and 1978, the period covered by the ICDA/8. In 1979, when the ninth revision was introduced, asthma mortality coincidentally began to increase and the trend has been upward until at least 1996. How much of the increase is due to attention directed to the disease, leading to improved diagnosis, and/or changes in ICD coding is difficult to determine.

In 1997, the survey used to determine the prevalence of asthma in the United States changed. Prior to 1997, prevalence was based on NHIS estimates of individuals who had, or knew someone in the family who had, asthma during the past 12 months. The new survey estimates “asthma attack prevalence” by limiting the count to individuals who answer yes to the question, “During the past 12 months, have you had an episode of asthma or asthma attack?” As a result, the 1997 to 2000 estimates are not comparable to those based on the NHIS of 1996 and earlier. A break in the asthma prevalence trend line between 1996 and 1997 in Chart 4–18 is used to indicate the discontinuity.

Lung Diseases

Chart 4–1

Deaths From Lung Diseases, Percent by Subgroup, U.S., 1999

Conditions	Percent
COPD	50.7
Influenza and Pneumonia	27.3
External Agents	7.0
Cardiopulmonary Diseases	5.6
Other	4.9
Neonatal Pulmonary Disorders	2.5
Asthma	2.0

Total Deaths = 233,659 (100%)

Chart 4–2

Number of Hospitalizations, Physician Office Visits, and Deaths for Selected Lung Diseases, U.S., 1999

Diagnostic category	ICD/9 Codes	Hospitalizations		Physician Office Visits (1,000)	ICD/10 Codes	Deaths
		Hospital Discharges (1,000)	Length of Stay			
Total		3,491	5.7	31,440		233,659
Acute lower respiratory infections						
Influenza and pneumonia	480-487	1,416	6.0	5,966	J10-J18	63,730
Acute bronchitis	466	298	3.3	2,640	J20	304
Acute bronchiolitis	included in 466	—	—	—	J21	84
Chronic lower respiratory disease						
COPD	490-492, 494-496	713	5.1	12,345	J40-J44	118,554
Chronic bronchitis	490, 491	567	5.1	8,643	J40-J42	1,172
Emphysema	492	24	5.1	208	J43	17,787
Other COPD	495-496	122	4.7	3,494	J44	99,595
Bronchiectasis	494	6	6.0	45	J47	970
Asthma	493	478	3.2	9,498	J45	4,172
Status asthmaticus	included in 493				J46	485
Cystic fibrosis	277.0	12	10.0	—	E84	485
Lung disease due to external agents	500-508	170	9.0	—	J60-J70	16,471
Adult respiratory distress syndrome	518.5	—	—	—	J80	2,125
Pulmonary edema	518.4	7	3.6	—	J81	746
Interstitial lung diseases:						
Sarcoidosis	135	6	6.3	130	D86	572
Respiratory tuberculosis	011, 012	7	10.3	148	A15, A16, A19, A31.0	997
Respiratory failure	518.8	206	10.3	163	J96	3,597
Pulmonary manifestations of connective tissue disorders	446.2, 446.4	—	—	113	J99, M31.0, M31.3	414
Cardiopulmonary diseases:						
Pulmonary embolism	415.1	90	7.5	92	I26	9,008
Other pulmonary heart disease	415.2-417	13	5.7	15	I27	4,172
Selected HIV-related and other pulmonary infections	114-116, 117.3, 117.5, 117.7, 136.3	5	13.6	47	B38-40, B44-46, B59	959
Neonatal pulmonary disorders						
RDS	769	17	22.6	—	P22.0	1,024
SIDS	798.0	—	—	—	R95	2,648
Congenital malformation of the lung	745.4, 745.5, 745.6	15	—	238	Q33	545
Bronchopulmonary dysplasia	770.7	—	—	—	P27.1	335
Atelectasis of newborn	770.4, 770.5	—	—	—	P28.0, P28.1	647
Other perinatal respiratory diseases	770.1-770.3, 770.6, 770.8, 770.9	32	—	—	P25, P26, P27.0, P27.8, P27.9, P28.2-P28.9	615

Note: Estimates of hospitalizations and physician office visits are subject to sampling variability. Estimates of hospitalizations 15,000 or below have a relative standard error of more than 16 percent. Estimates of physician office visits below 1 million have a relative standard error of more than 30 percent.

Compiled from references 11, 28, and 32.

Chart 4-3

Age-Adjusted Death Rates for Total Lung Diseases by Race and Sex, U.S., 1999

In 1999, total lung disease mortality (other than lung cancer) was higher in males than in females. It was not markedly different between blacks and whites.^{11, 25}

Sex	Deaths/100,000 Population		
	Total	White	Black
Male	106.5	106.7	113.2
Female	73.6	74.6	69.4

Chart 4-4

Death Rates for Total Lung Diseases by Age, Race, and Sex, U.S., 1999

In 1999, the male-female gap in mortality from total lung diseases increased for blacks and whites with increasing age.^{11, 25}

Ages	Deaths/100,000 Population			
	White Male	White Female	Black Male	Black Female
35-44	6.4	6.1	19.6	19.2
45-54	18.9	16.6	48.4	36.0
55-64	80.0	66.1	123.2	77.8
65-74	307.6	220.2	325.8	178.4
75-84	836.9	561.0	802.9	422.4

Chronic Obstructive Pulmonary Disease

Chart 4-5

Prevalence of Chronic Bronchitis by Age, U.S., 1980-2000

The prevalence of chronic bronchitis increased from 1980 to 1995. No clear trend was apparent between 1997 and 2000.^{15, 20, 40}

Year	Percent of Population		
	Ages 18-44	Ages 45-64	Ages 65+
1980	3.12	4.06	5.69
1981	2.81	4.09	4.61
1982	2.45	4.42	5.20
1983	3.79	4.47	5.83
1984	3.95	5.46	6.30
1985	4.05	5.43	6.27
1986	3.65	4.58	6.00
1987	4.04	5.69	7.59
1988	3.90	5.61	6.48
1989	4.45	5.37	5.55
1990	4.15	5.74	7.04
1991	4.67	5.39	5.25
1992	4.70	5.83	6.96
1993	4.58	6.12	6.17
1994	4.67	6.39	6.05
1995	5.02	6.39	6.41
1996	4.54	5.91	6.35
1997	4.14	5.56	6.64
1998	3.53	5.50	6.31
1999	3.67	5.05	5.87
2000	3.57	5.54	6.50

Note: Discontinuity between 1996 and 1997 is due to change in the question used to determine prevalence.

Chart 4–6

Prevalence of Chronic Bronchitis by Age, Sex, and Race, U.S., 2000

In 2000, the prevalence of chronic bronchitis was higher in females than in males for all age groups. It was higher for whites than for blacks, ages 18–44 and 65 and older, slightly higher for black females than white females, ages 45–64.²⁰

Ages	Percent of Population			
	White Male	White Female	Black Male	Black Female
18–44	2.62	5.09	1.83	3.51
45–64	3.48	7.64	3.52	8.58
65+	5.36	7.67	4.75	5.34

Chart 4–7

Prevalence of Emphysema by Age, U.S., 1980–2000

The prevalence of emphysema declined from 1980 to 1996. No clear trend was apparent between 1997 and 2000.^{15, 20, 40}

Year	Percent of Population	
	Ages 45–64	Ages 65+
1980	2.21	5.42
1981	2.10	4.29
1982	2.54	4.03
1983	2.06	3.93
1984	2.16	4.20
1985	1.52	4.58
1986	1.84	4.00
1987	1.69	4.17
1988	1.68	3.75
1989	1.72	3.63
1990	1.28	4.54
1991	1.28	3.24
1992	1.50	3.46
1993	1.56	2.98
1994	0.99	4.65
1995	1.30	3.41
1996	1.32	3.24
1997	2.24	5.33
1998	1.87	5.06
1999	1.60	5.04
2000	1.89	5.28

Note: Discontinuity between 1996 and 1997 is due to change in the question used to determine prevalence.

Chart 4–8

Prevalence of Emphysema by Sex and Race, Ages 45–64 and 65+, U.S., 2000

In 2000, the prevalence of emphysema for males and females was higher in whites than in blacks. For blacks and whites, it was higher in males than in females; the difference was small for black males and females ages 45–64.²⁰

Ages	Percent of Population			
	White Male	White Female	Black Male	Black Female
45–64	2.26	1.85	1.21	0.98
65+	7.37	4.19	5.86	3.12

Chart 4–9**Hospitalization Rates for Chronic Obstructive Pulmonary Disease, Ages 45–64 and 65+, U.S., 1970–2000**

Between 1970 and 2000, COPD hospitalization rates varied considerably.^{28–29}

Year	Hospitalization/10,000 Population	
	Ages 45–64	Ages 65+
1970	31.5	83.0
1971	28.7	64.8
1972	26.1	67.8
1973	27.2	60.8
1974	30.5	63.0
1975	42.3	98.3
1976	43.0	105.2
1977	47.4	109.9
1978	47.1	117.8
1979	39.8	103.9
1980	43.4	126.5
1981	43.9	129.1
1982	47.5	128.3
1983	42.9	133.7
1984	36.2	109.1
1985	34.3	99.8
1986	29.8	91.2
1987	23.4	68.7
1988	15.4	42.6
1989	14.4	42.6
1990	14.7	49.1
1991	18.4	54.5
1992	23.5	86.2
1993	26.2	96.1
1994	27.5	114.0
1995	28.6	110.6
1996	29.8	114.0
1997	30.8	123.8
1998	31.0	132.0
1999	32.7	139.9
2000	45.3	143.2

Chart 4–10**Age-Adjusted Death Rates for Chronic Obstructive Pulmonary Disease by Race and Sex, U.S., 1960–2000**

COPD mortality, though highest in white males, remained relatively constant for them since the early 1980s. During the same period, it gradually increased in black males, but doubled in black females and in white females.^{11, 22–26, 41}

Year	Deaths/100,000 Population			
	White Male	White Female	Black Male*	Black Female*
1960	16.4	2.8	9.7	2.0
1961	17.4	2.9	10.1	2.3
1962	21.2	3.3	11.2	2.5
1963	26.0	4.1	14.2	2.9
1964	26.6	4.0	13.8	2.2
1965	30.7	4.7	15.6	2.3
1966	33.2	5.0	16.4	2.6
1967	33.6	5.2	18.1	3.2
1968	38.1	6.4	21.2	3.6
1969	37.3	6.6	22.5	3.6
1970	38.1	7.0	23.5	3.8
1971	40.8	7.5	23.5	5.2
1972	42.6	8.0	25.5	4.6
1973	44.8	8.9	25.5	4.4
1974	43.9	9.1	24.5	4.0
1975	44.9	9.5	24.7	4.7
1976	47.1	10.5	27.8	4.8
1977	46.4	10.8	27.5	5.2
1978	48.4	12.4	29.2	6.0
1979	46.2	12.0	27.9	5.3
1980	50.3	14.2	29.4	6.2
1981	50.7	15.2	32.2	6.6
1982	50.1	15.7	30.7	7.5
1983	53.3	17.7	34.1	8.1
1984	53.7	19.0	35.4	9.0
1985	56.1	20.9	37.5	9.9
1986	55.4	21.8	38.9	9.5
1987	54.4	22.5	37.8	10.8
1988	55.4	24.1	41.2	10.8
1989	53.5	25.2	40.4	12.7
1990	55.0	25.8	43.2	12.5
1991	55.1	27.2	41.5	13.2
1992	54.0	27.8	44.8	13.6
1993	57.1	31.0	44.8	14.8
1994	55.3	31.3	42.6	15.5
1995	54.7	31.4	42.5	15.6
1996	54.0	32.8	41.4	16.1
1997	54.4	33.5	41.3	16.0
1998	54.9	35.4	40.8	17.0
1999	55.5	36.4	44.0	18.6
2000	53.2	36.9	39.6	18.0

* Nonwhite from 1960 to 1967.

Chart 4–11**Age-Adjusted Death Rates for Chronic Obstructive Pulmonary Disease* by Race/Ethnicity and Sex, U.S., 1985–1999**

Male: Deaths/100,000 Population					
Year	Black	White**	American Indian	Hispanic	Asian
1985	43.90	58.06	29.63	27.63	28.04
1986	44.11	57.98	29.98	27.58	28.08
1987	44.32	57.91	30.33	27.53	28.13
1988	44.53	57.83	30.68	27.49	28.17
1989	44.75	57.76	31.04	27.44	28.21
1990	44.96	57.69	31.41	27.40	28.25
1991	45.18	57.61	31.77	27.35	28.30
1992	45.40	57.54	32.14	27.31	28.34
1993	45.62	57.47	32.52	27.26	28.38
1994	45.84	57.39	32.90	27.21	28.42
1995	46.06	57.32	33.28	27.17	28.47
1996	46.28	57.25	33.67	27.12	28.51
1997	46.50	57.17	34.07	27.08	28.55
1998	46.73	57.10	34.46	27.03	28.60
1999	46.95	57.03	34.87	26.99	28.64

Female: Deaths/100,000 Population					
Year	Black	White**	American Indian	Hispanic	Asian
1985	13.55	23.78	11.81	11.67	11.06
1986	14.09	24.66	12.44	11.98	11.12
1987	14.65	25.56	13.10	12.30	11.17
1988	15.23	26.51	13.79	12.63	11.23
1989	15.83	27.48	14.52	12.97	11.28
1990	16.46	28.49	15.29	13.32	11.34
1991	17.11	29.54	16.11	13.68	11.40
1992	17.79	30.63	16.96	14.05	11.45
1993	18.50	31.76	17.86	14.43	11.51
1994	19.23	32.92	18.81	14.82	11.56
1995	19.99	34.14	19.81	15.21	11.62
1996	20.78	35.39	20.86	15.62	11.68
1997	21.61	36.69	21.96	16.04	11.74
1998	22.46	38.05	23.13	16.48	11.79
1999	23.35	39.45	24.36	16.92	11.85

* COPD and allied conditions.

** Non-Hispanic.

Note: Each line is a log-linear regression derived from the actual rates.

Chart 4–12

Death Rates for Chronic Obstructive Pulmonary Disease in Males by Age and Race, U.S., 1960–2000

After initial increases in the 1960s, COPD death rates declined in white males and in black males ages 45–54 and 55–64, became relatively stable for white males at ages 65–74, and continued to increase for those ages 75 and older.^{11, 22–26, 41}

Year	White: Deaths/100,000 Population					Black*: Deaths/100,000 Population				
	Ages 45–54	Ages 55–64	Ages 65–74	Ages 75–84	Ages 85+	Ages 45–54	Ages 55–64	Ages 65–74	Ages 75–84	Ages 85+
1960	8.5	36.1	82.8	101.8	111.2	9.7	24.0	42.6	36.7	66.8
1961	7.6	38.7	87.8	111.8	122.2	9.4	23.0	43.0	49.7	66.6
1962	9.5	44.2	107.2	136.7	154.8	9.0	25.6	54.1	50.3	69.0
1963	11.7	52.3	131.2	169.6	202.7	12.6	31.8	62.4	68.5	131.1
1964	12.1	51.8	131.6	181.9	202.3	10.8	34.7	58.8	71.0	68.8
1965	12.4	57.8	153.6	216.6	235.5	15.5	34.8	61.8	93.8	132.3
1966	12.4	61.9	161.9	244.8	258.5	16.2	35.5	68.3	86.0	111.1
1967	12.4	61.2	164.8	248.6	263.9	15.1	36.9	75.1	104.9	128.2
1968	13.1	67.3	186.7	286.5	307.8	21.6	47.8	84.1	126.1	114.6
1969	13.9	67.5	189.5	294.3	305.1	19.9	50.9	93.0	133.5	145.5
1970	13.6	68.1	196.5	311.5	280.9	16.6	59.4	95.0	148.5	131.8
1971	13.5	67.3	195.6	327.4	334.6	19.0	52.9	99.8	135.5	155.1
1972	13.0	67.7	204.8	351.4	354.8	21.0	55.8	105.8	171.6	153.0
1973	12.7	69.8	210.1	378.4	393.5	18.8	56.6	109.6	153.4	188.7
1974	12.8	64.8	204.8	380.4	379.8	15.2	53.3	120.4	137.8	180.2
1975	11.9	64.7	207.6	399.7	402.7	16.7	51.5	103.4	170.3	156.3
1976	12.2	64.0	210.7	419.7	482.8	19.1	55.1	118.3	179.1	197.0
1977	11.4	60.1	206.1	431.5	459.5	18.0	56.7	120.3	174.5	204.1
1978	11.1	60.1	213.2	430.1	515.7	18.6	59.7	129.9	182.4	270.7
1979	10.2	56.2	200.1	412.7	511.5	16.4	51.0	123.9	195.4	269.5
1980	10.5	58.1	213.2	450.3	601.1	16.8	61.8	133.3	217.5	255.5
1981	10.3	57.7	214.4	454.0	622.0	16.7	56.8	141.5	244.7	262.5
1982	9.6	55.2	205.9	462.6	616.1	15.1	53.0	142.8	217.0	269.0
1983	9.9	57.7	215.4	494.2	691.0	12.6	65.2	147.5	263.2	333.3
1984	9.1	58.8	212.7	493.9	724.4	16.6	59.1	161.5	282.8	311.5
1985	9.5	58.1	220.6	516.5	785.6	14.9	61.8	168.1	311.7	366.1
1986	9.3	57.5	216.1	513.3	772.9	15.7	63.1	181.4	307.7	419.0
1987	8.0	57.9	204.5	513.0	766.3	12.8	57.7	176.2	314.2	425.0
1988	8.5	58.6	210.7	512.0	814.6	14.7	60.9	189.3	360.1	430.8
1989	7.6	58.0	199.3	492.8	808.6	12.7	59.9	180.0	359.3	463.6
1990	7.5	56.4	203.1	503.8	829.7	13.0	59.4	172.4	377.2	483.3
1991	7.3	55.7	202.0	502.2	851.2	14.4	57.8	172.4	344.7	472.5
1992	7.3	54.4	200.0	485.1	845.1	11.2	56.5	165.0	342.0	536.9
1993	7.8	56.1	208.7	518.6	900.7	13.2	57.5	173.2	392.5	545.8
1994	7.7	54.2	201.7	495.5	842.4	11.5	52.4	172.1	359.8	549.9
1995	7.1	50.8	197.4	488.1	906.7	11.6	55.2	163.2	353.6	589.6
1996	7.3	50.1	194.3	483.1	900.6	9.9	55.3	149.5	364.7	552.1
1997	7.3	49.1	203.2	474.0	925.0	10.3	47.8	163.4	360.8	549.1
1998	6.6	49.1	207.2	485.8	909.1	10.0	49.3	154.3	358.2	545.1
1999	7.1	49.8	206.3	487.2	934.2	11.4	53.5	159.9	393.1	599.8
2000	7.1	46.1	195.1	454.3	909.6	10.5	48.1	153.3	332.1	557.1

* Nonwhite from 1960 to 1967.

Chart 4–13

Death Rates for Chronic Obstructive Pulmonary Disease in Females by Age and Race, U.S., 1960–2000

Since 1960, COPD death rates have increased in white females and in black females at all ages. For the last several years, however, the rates have been relatively stable among those in the younger age range, but continued to increase among those in older age ranges.^{11, 22–26, 41}

Year	White: Deaths/100,000 Population					Black*: Deaths/100,000 Population				
	Ages 45–54	Ages 55–64	Ages 65–74	Ages 75–84	Ages 85+	Ages 45–54	Ages 55–64	Ages 65–74	Ages 75–84	Ages 85+
1960	1.7	4.2	8.4	18.0	36.5	1.8	2.8	5.1	7.2	29.8
1961	1.7	4.4	9.2	18.8	37.9	1.2	3.0	5.5	12.8	37.5
1962	2.4	5.2	10.2	23.4	44.7	1.7	4.3	6.0	14.6	22.5
1963	2.9	6.1	12.5	26.7	54.1	2.3	4.8	8.2	10.5	42.8
1964	2.9	6.9	13.3	26.8	49.3	3.3	4.0	3.6	8.2	24.4
1965	3.4	8.0	16.0	29.8	53.8	2.7	4.7	6.5	9.4	16.3
1966	3.7	9.2	18.1	29.8	54.1	2.8	5.3	8.5	10.9	18.9
1967	3.8	10.2	18.0	31.4	58.0	2.3	5.1	9.5	13.0	22.8
1968	4.5	13.3	22.8	38.0	70.7	3.5	8.1	8.2	17.1	36.0
1969	5.0	13.3	24.3	39.3	74.5	4.3	7.2	8.7	17.2	33.9
1970	5.7	15.3	27.9	39.9	59.1	4.2	8.6	11.9	17.4	26.7
1971	5.7	15.5	29.8	45.5	66.8	5.9	9.3	15.5	18.9	26.3
1972	5.6	17.1	34.7	47.3	65.8	4.1	8.4	14.0	22.1	46.4
1973	5.8	18.8	37.6	53.4	80.7	5.7	11.4	13.2	23.3	27.3
1974	6.0	20.0	39.7	57.4	70.2	3.9	9.5	16.9	18.4	25.8
1975	6.0	21.5	41.9	58.7	74.0	5.3	9.6	16.8	22.6	26.4
1976	6.2	21.7	46.1	68.6	86.1	5.2	12.8	17.3	21.5	30.6
1977	5.9	22.1	49.6	70.5	91.1	5.5	11.5	17.9	27.4	40.1
1978	6.8	25.3	57.0	80.5	109.6	5.5	16.1	17.5	31.3	60.6
1979	5.9	23.8	55.0	80.8	107.0	4.5	13.1	21.4	30.3	41.2
1980	6.4	26.4	66.8	97.3	134.6	5.0	15.8	25.4	34.4	60.5
1981	6.8	27.4	72.4	107.6	134.9	5.2	16.9	23.9	42.9	43.4
1982	6.5	27.0	75.8	113.0	143.4	5.5	19.6	30.0	43.8	52.5
1983	7.0	29.9	85.5	129.1	164.2	4.9	18.2	30.5	50.5	86.3
1984	6.6	31.7	89.2	143.5	182.5	5.3	20.7	35.9	56.1	89.9
1985	7.5	34.4	95.5	162.5	205.0	6.0	23.2	39.1	67.1	85.7
1986	7.3	35.2	100.9	169.8	211.8	5.6	22.4	41.7	59.0	85.5
1987	6.7	35.7	102.2	177.8	233.3	5.3	23.8	44.3	73.6	105.6
1988	6.6	37.2	109.7	195.3	247.1	6.6	24.6	46.2	66.8	100.7
1989	7.0	40.1	111.7	204.6	262.0	6.6	27.9	55.8	84.2	119.6
1990	6.5	38.3	112.4	215.5	280.7	6.3	25.2	54.4	84.3	122.4
1991	6.6	41.1	120.2	226.3	293.1	7.4	24.7	60.0	84.9	133.7
1992	5.7	40.0	121.0	236.1	311.9	6.0	22.7	61.7	91.5	150.5
1993	6.1	43.8	136.9	264.9	342.5	5.8	24.4	66.7	107.9	145.4
1994	6.4	41.6	135.2	269.0	365.0	6.4	25.9	66.9	108.7	179.6
1995	6.4	40.5	133.5	271.3	383.2	5.6	24.1	64.9	119.9	177.6
1996	6.1	40.8	139.3	285.6	403.8	6.6	23.7	69.5	115.4	198.3
1997	5.9	41.4	140.2	293.1	423.6	4.1	24.8	69.5	122.7	197.1
1998	6.1	40.7	151.0	309.3	455.1	5.8	23.6	73.9	131.0	201.6
1999	6.2	41.4	149.4	320.6	488.6	5.9	25.4	74.2	153.1	227.1
2000	6.3	39.7	152.3	323.6	504.8	6.3	26.1	69.8	141.3	231.1

* Nonwhite from 1960 to 1967.

Chart 4–14**Age-Adjusted Death Rates for Chronic Obstructive Pulmonary Disease by State, U.S., 1996–98**

In 1996–98, COPD mortality tended to be highest in the western Mountain States.^{11, 22–26}

State Name	Deaths/100,000 Population
Nevada	61.7
Wyoming	57.1
Montana	54.8
Colorado	53.0
West Virginia	51.8
Maine	50.5
Kentucky	49.1
Arizona	48.2
New Hampshire	47.4
Oklahoma	46.1
New Mexico	46.0
Oregon	45.5
Tennessee	45.1
Vermont	45.0
Indiana	44.6
Idaho	44.3
Alaska	44.1
Ohio	43.8
Washington	43.6
Missouri	43.1
Georgia	42.2
North Carolina	41.6
Kansas	41.3
Alabama	41.0
Arkansas	41.0
California	40.8
Delaware	40.7
Texas	40.6
Nebraska	40.1
South Carolina	40.1
Mississippi	39.4
Virginia	38.7
Florida	38.5
Iowa	37.9
Michigan	37.4
Maryland	36.7
Louisiana	36.1
Pennsylvania	35.9
Wisconsin	35.3
Illinois	35.0
Massachusetts	35.0
Rhode Island	35.0
South Dakota	35.0
Minnesota	34.1
North Dakota	32.7
Connecticut	32.1
New Jersey	31.7
New York	30.8
Utah	30.2
Hawaii	19.0

Chart 4–15

Age-Adjusted Death Rates* for Chronic Obstructive Pulmonary Disease by Country and Sex, Ages 35–74, 1999**

Among 15 industrialized countries, the United States ranked third in COPD mortality for females and fourth for males in 1999.⁸

Country	Deaths/100,000 Population	
	Male	Female
HUN	61.33	21.39
DEN (98)	55.72	57.39
SCO (00)	52.18	37.12
USA	46.77	33.87
ROM	45.58	12.81
NTH	35.60	19.60
PUL	34.67	7.35
AUL	33.15	17.57
FIN	28.85	8.62
GER	27.80	9.53
NOR (98)	27.19	17.93
CZR	23.12	7.06
SWE (98)	17.05	12.82
KOR	15.11	3.83
JPN	7.01	1.18

* Age-adjusted to European standard.

** Data for 1999 unless otherwise noted in parentheses.

Chart 4–16

Age-Adjusted Death Rates for Chronic Obstructive Pulmonary Disease by Race and Sex, U.S., 2000

In 2000, COPD mortality was higher in males than in females. For males, it was one-third higher in whites than in blacks, and for females, it was two times higher in whites than in blacks.^{24, 26}

Sex	Deaths/100,000 Population		
	Total	White	Black
Male	54.3	56.2	41.9
Female	36.5	39.0	19.0

Chart 4–17

Death Rates for Chronic Obstructive Pulmonary Disease by Age, Race, and Sex, U.S., 2000

In 2000, COPD mortality increased significantly with age for all race and sex groups. It was highest in white males ages 65 and older and lowest in black females ages 55 and older.^{24, 26}

Ages	Deaths/100,000 Population			
	White Male	White Female	Black Male	Black Female
35–44	1.0	1.0	1.8	1.5
45–54	7.5	6.7	11.1	6.8
55–64	48.7	41.9	50.8	27.6
65–74	206.0	160.9	161.9	73.7
75–84	495.4	341.8	350.8	149.3

Asthma

Chart 4–18

Prevalence of Asthma Ages <18 and 18+, U.S., 1980 to 2000

Between 1980 and the mid-1990s, the prevalence of asthma increased; from 1997 to 2000, asthma attack prevalence remained relatively stable.^{20, 40}

Year	Percent of Population	
	Ages <18	Ages 18+
1980	3.75	3.0
1981	3.79	3.2
1982	4.01	3.3
1983	4.52	3.6
1984	4.25	3.4
1985	4.78	3.3
1986	5.11	3.7
1987	5.25	3.6
1988	4.99	3.8
1989	6.10	4.3
1990	5.76	3.6
1991	6.25	4.2
1992	6.34	4.4
1993	7.16	4.4
1994	6.91	5.1
1995	7.49	5.0
1996	6.20	5.3
1997	5.44	4.1
1998	5.31	4.1
1999	5.28	3.9
2000	5.53	4.0

Note: Discontinuity between 1996 and 1997 is due to change in the question used to determine prevalence.

Chart 4–19

Asthma Attack Prevalence by Age, Sex, and Race, U.S., 2000

In 2000, asthma attack prevalence within racial groups was higher for females than for males ages 18 and older; for those younger than 18, it was higher for males than for females. Within sex groups, the prevalence was higher in blacks than in whites for each age group except for ages 18–44, where it was higher in white females than in black females.²⁰

Ages	Percent of Population			
	White Male	White Female	Black Male	Black Female
<18	6.19	3.98	8.19	7.20
18–44	2.16	5.45	2.69	2.96
45–64	2.07	4.94	2.96	5.60
65+	2.34	2.93	2.57	4.06

Chart 4–20**Physician Office Visits for Asthma, U.S., 1989–1999**

Between 1989 and 1999, the number of physician office visits for asthma has increased.³⁰

Year	Number (Millions)
1989	6.8
1990	7.1
1991	8.8
1992	9.7
1993	11.3
1994	10.8
1995	9.0
1996	9.0
1997	9.8
1998	12.9
1999	9.5

Chart 4–21**Hospitalizations for Asthma, U.S., 1980–2000**

Hospitalizations with asthma as the primary diagnosis remained relatively stable between 1980 and 2000; hospitalizations with asthma as a secondary diagnosis, however, increased significantly during the 1990s.^{28–29}

Year	Number (Thousands)	
	Primary	Secondary
1980	379	192
1981	418	210
1982	434	230
1983	459	250
1984	465	274
1985	462	281
1986	477	303
1987	454	331
1988	479	349
1989	475	360
1990	476	385
1991	490	433
1992	463	493
1993	468	532
1994	451	602
1995	511	665
1996	474	709
1997	484	758
1998	423	833
1999	479	869
2000	465	926

Chart 4–22**Hospitalization Rates for Asthma by Age, U.S., 1980–2000**

From 1980 to 2000, hospitalization rates for asthma in the 15–44 age group were the lowest of the four age groups; since 1991, they were highest in the younger than 15 age group. For those 45 and older, the rates have been decreasing since the mid-1980s.^{28–29}

Year	Hospitalizations/10,000 Population			
	Ages <15	Ages 15–44	Ages 45–64	Ages 65+
1980	24.3	9.5	22.9	34.5
1981	25.0	10.6	23.3	28.3
1982	29.3	9.7	22.1	30.4
1983	26.4	10.1	26.7	34.2
1984	28.9	9.9	22.8	37.3
1985	27.8	11.1	21.5	34.1
1986	30.3	10.8	22.0	33.7
1987	28.4	9.7	20.4	33.8
1988	30.9	9.6	20.2	31.0
1989	31.2	11.0	18.9	30.0
1990	30.8	10.3	18.3	32.3
1991	33.9	10.9	18.2	28.5
1992	34.6	9.9	16.5	23.7
1993	28.0	10.9	19.0	26.6
1994	29.5	10.7	15.8	23.0
1995	36.7	11.4	16.7	23.0
1996	33.8	11.1	16.4	17.4
1997	35.8	9.6	15.9	19.2
1998	27.7	8.6	16.2	17.7
1999	31.5	10.0	15.9	21.2
2000	34.7	9.2	13.7	19.5

Chart 4–23**Age-Adjusted Death Rates for Asthma by Race and Sex, Ages 1–24, U.S., 1980–2000**

Although asthma mortality fluctuated between 1980 and 2000, it tended to increase for each race/sex group, ages 1–24.^{11, 22–26}

Year	Deaths/100,000 Population			
	White Male	White Female	Black Male	Black Female
1980	0.18	0.14	1.03	0.57
1981	0.20	0.22	1.17	0.48
1982	0.27	0.27	1.49	0.64
1983	0.18	0.27	1.41	0.56
1984	0.20	0.22	0.97	0.56
1985	0.20	0.28	1.53	0.83
1986	0.28	0.28	1.44	0.68
1987	0.28	0.28	1.61	0.77
1988	0.28	0.31	1.67	0.75
1989	0.32	0.31	1.59	0.62
1990	0.32	0.28	1.57	0.61
1991	0.32	0.37	1.83	0.84
1992	0.31	0.31	1.83	0.93
1993	0.33	0.37	1.75	0.81
1994	0.40	0.39	2.49	0.95
1995	0.41	0.49	2.30	0.82
1996	0.34	0.43	1.77	1.01
1997	0.44	0.33	1.96	0.77
1998	0.29	0.33	2.37	0.92
1999	0.30	0.23	1.60	0.77
2000	0.26	0.20	1.31	0.81

Chart 4–24

Death Rates for Asthma by Age, U.S., 1980–2000

During the 1980s, asthma mortality increased for all ages; it remained relatively constant during the 1990s for most age groups. The rates for age groups 55–54, 65–74, 65–74, and 75–84 began to decrease in the late 1990s.^{11, 22–26}

Year	Deaths/100,000 Population							
	Ages 15–24	Ages 25–34	Ages 35–44	Ages 45–54	Ages 55–64	Ages 65–74	Ages 75–84	Ages 85+
1980	0.2	0.4	0.6	1.4	2.4	4.9	7.7	9.9
1981	0.3	0.4	0.7	1.4	2.8	5.1	7.2	9.7
1982	0.4	0.4	0.6	1.5	2.6	4.9	7.2	9.6
1983	0.4	0.5	0.8	1.7	3.1	5.1	8.2	11.3
1984	0.3	0.4	0.7	1.6	3.0	5.4	8.2	11.5
1985	0.4	0.4	0.7	1.7	3.4	5.5	8.9	12.3
1986	0.4	0.5	0.8	1.6	3.1	5.7	9.2	12.6
1987	0.5	0.5	1.0	1.9	3.2	6.1	9.4	14.2
1988	0.4	0.5	1.0	1.8	3.6	6.1	10.4	14.6
1989	0.4	0.6	0.9	1.9	3.4	6.6	11.2	15.5
1990	0.4	0.5	0.9	2.0	3.5	6.2	10.7	16.9
1991	0.5	0.7	1.0	2.0	3.5	6.3	11.3	17.5
1992	0.5	0.5	0.9	1.8	3.3	6.3	10.4	18.7
1993	0.5	0.6	1.0	1.8	3.5	6.4	10.4	18.3
1994	0.6	0.7	1.0	2.0	3.7	6.5	10.6	18.3
1995	0.6	0.7	1.2	2.1	3.7	6.1	10.7	18.3
1996	0.6	0.7	1.1	2.0	3.8	5.9	10.3	19.6
1997	0.5	0.8	1.1	1.9	3.5	5.4	10.1	19.4
1998	0.5	0.6	1.0	1.8	2.9	5.2	10.0	20.9
1999	0.5	0.8	1.1	1.9	2.8	4.7	8.5	19.3
2000	0.5	0.7	1.1	1.8	2.5	4.5	7.9	18.4

Chart 4–25

Age-Adjusted Death Rates for Asthma by Race and Sex, U.S., 2000

In 2000, asthma mortality was 3 times higher in black males than in white males, more than 2.5 times higher in black females than in white females, and 42 percent higher overall in females than in males.^{24, 26}

Sex	Deaths/100,000 Population		
	Total	White	Black
Male	1.29	0.99	3.33
Female	1.83	1.53	4.11

Chart 4–26

Death Rates for Asthma by Age, Race, and Sex, U.S., 2000

In 2000, asthma mortality was much higher in blacks than in whites at each age. Within both race groups, it was higher in females than in males.^{24, 26}

Ages	Deaths/100,000 Population			
	White Male	White Female	Black Male	Black Female
35–44	0.5	0.9	2.9	3.5
45–54	0.9	1.7	3.8	7.7
55–64	1.7	2.9	5.9	9.7
65–74	3.7	5.2	10.1	11.7
75–84	7.8	10.9	12.9	15.2

Chart 4–27**Age-Adjusted Death Rates for Asthma by Sex, U.S., 1951–2000**

Asthma mortality declined from 1950 to 1978 and then began to increase. Rates were much higher in males than in females before the late-1960s, but then became higher in females than in males.^{11, 22–26}

Year	Deaths/100,000 Population	
	Male	Female
1951	8.11	4.06
1952	7.88	3.85
1953	7.62	3.60
1954	6.77	3.24
1955	6.61	3.05
1956	6.41	2.91
1957	7.13	3.10
1958	5.24	2.30
1959	4.87	2.29
1960	5.14	2.55
1961	4.58	2.30
1962	4.49	2.22
1963	4.49	2.32
1964	3.67	2.18
1965	3.71	2.17
1966	3.41	2.09
1967	3.08	2.08
1968	1.61	1.60
1969	1.37	1.38
1970	1.26	1.40
1971	1.14	1.31
1972	1.24	1.36
1973	0.99	1.11
1974	1.00	1.03
1975	1.00	1.11
1976	0.97	1.10
1977	0.84	0.89
1978	0.85	1.04
1979	1.30	1.30
1980	1.50	1.41
1981	1.43	1.50
1982	1.39	1.54
1983	1.56	1.77
1984	1.59	1.72
1985	1.63	1.87
1986	1.64	1.89
1987	1.78	2.06
1988	1.82	2.15
1989	1.85	2.29
1990	1.87	2.22
1991	1.85	2.34
1992	1.81	2.25
1993	1.83	2.33
1994	1.91	2.38
1995	1.88	2.49
1996	1.82	2.44
1997	1.72	2.33
1998	1.66	2.26
1999	1.51	2.22
2000	1.44	2.05

Note: Sudden changes in the rates are most likely due to revisions to the ICD.

Chart 4–28**Age-Adjusted Death Rates for Asthma by Race, U.S., 1951–2000**

Between 1978 and 2000, the black-white gap in asthma mortality increased, with the rate being much higher in blacks than in whites.^{11, 22–26}

Year	Deaths/100,000 Population	
	White	Black*
1951	6.00	5.04
1952	5.73	5.81
1953	5.56	4.75
1954	4.93	4.63
1955	4.65	4.49
1956	4.52	4.64
1957	4.83	5.90
1958	3.54	4.44
1959	3.35	4.54
1960	3.56	5.00
1961	3.15	4.71
1962	3.10	4.39
1963	3.12	4.89
1964	2.67	4.41
1965	2.64	4.55
1966	2.48	4.27
1967	2.29	4.37
1968	1.34	3.88
1969	1.16	3.27
1970	1.10	2.96
1971	1.05	2.75
1972	1.16	2.51
1973	0.90	2.28
1974	0.92	1.96
1975	0.91	2.14
1976	0.92	2.05
1977	0.78	1.73
1978	0.88	1.78
1979	1.18	2.36
1980	1.28	2.75
1981	1.34	2.79
1982	1.32	2.99
1983	1.44	3.35
1984	1.45	3.22
1985	1.55	3.41
1986	1.52	3.59
1987	1.67	4.06
1988	1.73	4.40
1989	1.84	4.25
1990	1.79	4.16
1991	1.86	4.23
1992	1.78	4.22
1993	1.80	4.39
1994	1.89	4.51
1995	1.88	4.73
1996	1.84	4.83
1997	1.75	4.31
1998	1.69	4.31
1999	1.41	3.95
2000	1.31	3.80

* Nonwhite from 1951 to 1967.

Note: Sudden changes in the rates are most likely due to revisions to the ICD.

Chart 4–29**Age-Adjusted Death Rates for Asthma by Race and Sex, U.S., 1951–2000**

Trends in asthma mortality have been much more similar for males and females within race groups since 1970. The rates, however, have been higher for blacks than for whites.^{11, 22–26}

Year	Deaths/100,000 Population			
	White Male	White Female	Black Male*	Black Female*
1951	8.29	3.96	5.60	4.47
1952	7.97	3.69	6.36	5.18
1953	7.75	3.56	5.64	3.91
1954	6.85	3.20	5.19	3.59
1955	6.63	2.93	5.59	3.26
1956	6.45	2.83	5.71	3.51
1957	7.04	2.92	7.05	4.40
1958	5.19	2.10	5.11	3.84
1959	4.78	2.09	5.16	3.97
1960	5.03	2.32	5.69	4.35
1961	4.48	2.07	5.76	3.79
1962	4.46	2.03	5.12	3.75
1963	4.43	2.11	5.70	4.19
1964	3.50	2.02	5.25	3.68
1965	3.50	2.00	5.56	3.67
1966	3.24	1.92	5.19	3.47
1967	2.93	1.88	4.91	3.93
1968	1.36	1.34	4.19	3.70
1969	1.16	1.17	3.14	3.21
1970	1.08	1.18	3.05	3.29
1971	1.00	1.10	2.70	2.81
1972	1.06	1.21	2.81	2.51
1973	0.87	0.94	2.39	2.41
1974	0.90	0.93	2.08	2.04
1975	0.85	0.98	2.25	2.20
1976	0.86	0.97	2.14	2.17
1977	0.76	0.78	1.76	1.80
1978	0.75	0.95	1.90	1.76
1979	1.20	1.20	2.53	2.29
1980	1.32	1.26	2.90	2.64
1981	1.27	1.38	3.00	2.60
1982	1.23	1.37	2.96	2.99
1983	1.36	1.54	3.37	3.35
1984	1.37	1.50	3.25	3.22
1985	1.41	1.69	3.59	3.31
1986	1.43	1.63	3.39	3.77
1987	1.46	1.84	4.03	3.92
1988	1.53	1.87	4.33	4.35
1989	1.57	2.03	4.08	4.30
1990	1.58	1.97	4.39	4.06
1991	1.55	2.09	4.25	4.23
1992	1.50	1.98	3.95	4.46
1993	1.52	2.00	4.09	4.61
1994	1.58	2.09	4.43	4.63
1995	1.54	2.19	4.50	4.90
1996	1.52	2.09	4.33	5.13
1997	1.43	2.01	4.03	4.61
1998	1.33	1.95	3.79	4.70
1999	1.14	1.89	3.19	4.64
2000	1.11	1.71	3.72	4.60

* Nonwhite from 1950 to 1967.

Note: Sudden changes in the rates are most likely due to revisions to the ICD.

Chart 4–30**Age-Adjusted Death Rates* for Asthma by Country and Sex, 1999****

In 1999, among 15 countries, asthma mortality ranked 13th for males and 10th for females.⁸

Country	Rates/100,000 Population	
	Male	Female
KOR	17.64	9.31
POL	5.64	2.58
NOR (98)	4.43	3.85
GER	4.38	2.69
JPN	3.86	2.22
ROM	3.65	2.10
DEN (98)	2.64	2.29
HUN	1.89	1.59
AUL	1.68	2.45
SCO (00)	1.55	2.50
SWE (98)	1.41	1.62
CZR	1.27	0.91
USA	1.24	1.85
FIN (98)	1.08	1.21
NTH	0.44	0.57

* Age-adjusted to European standard.

** Data for 1999 unless otherwise noted in parentheses.

Neonatal Respiratory Distress Syndrome

Chart 4–31

Infant Mortality Rate* for, U.S., 1968–2000

Infant mortality for RDS declined steeply from 1974 to 1981, followed by a slower but appreciable decline.^{11, 22–24}

Year	Deaths/100,000 Live Births
1968	236.2
1969	247.9
1970	261.6
1971	267.6
1972	274.8
1973	277.8
1974	263.4
1975	248.0
1976	222.9
1977	198.3
1978	179.7
1979	156.2
1980	138.1
1981	119.0
1982	109.7
1983	101.2
1984	96.9
1985	98.2
1986	90.6
1987	86.2
1988	81.4
1989	89.9
1990	68.5
1991	62.5
1992	50.8
1993	45.4
1994	39.6
1995	37.3
1996	35.0
1997	33.5
1998	33.7
1999	27.3
2000	24.4

* Under age 1.

Chart 4–32**Infant Mortality Rate* for Respiratory Distress Syndrome by Race, U.S., 1979–2000**

Although the decrease in infant mortality for RDS has been appreciable in both blacks and whites during the past 20 years, a black-white gap still remained in 2000.^{11, 22–24}

Year	Deaths/100,000 Live Births	
	White	Black
1979	142.3	238.6
1980	125.8	187.9
1981	109.8	178.6
1982	100.3	171.3
1983	92.0	159.4
1984	89.3	149.1
1985	90.5	149.8
1986	81.5	144.2
1987	76.5	145.6
1988	70.5	142.4
1989	74.7	172.2
1990	54.6	143.8
1991	50.0	131.6
1992	41.3	143.3
1993	34.9	104.1
1994	32.1	83.4
1995	29.4	82.7
1996	27.3	79.5
1997	26.7	74.2
1998	27.6	73.9
1999	21.9	60.3
2000	19.5	54.7

* Under age 1.

Chart 4–33**Infant Mortality Rate for Neonatal Respiratory Distress Syndrome by Race/Ethnicity, U.S., 1999**

In 1999, infant mortality for neonatal RDS was highest in blacks and Puerto Ricans and lowest in Asian Pacific Islanders.⁴²

Race/Ethnicity	Deaths/100,000 Live Births
	RDS
All	28.5
Black	61.6
Puerto Rican	52.5
Central and S. American	31.0
Hispanic	25.5
Non-Hispanic White	21.8
Mexican-American	20.7
Asian Pacific Islanders	16.0

Note: No data for American Indians.

Sudden Infant Death Syndrome

Chart 4–34

Infant Mortality Rate for Sudden Infant Death Syndrome by Race/Ethnicity, U.S., 1999

In 1999, infant mortality for SIDS was highest in American Indians and blacks and lowest in Asian and Pacific Islanders.⁴²

Race/Ethnicity	Deaths/100,000 Live Births
	SIDS
All	66.8
American Indian	146.9
Black	130.9
Puerto Rican	66.5
Non-Hispanic White	62.1
Hispanic	37.2
Mexican-American	33.3
Asian Pacific Islanders	31.0

Note: No data for Central and South American.

5. Blood Diseases

The term *blood diseases* is used here to mean diseases within the diagnostic categories listed in “Diseases of the Blood and Blood-Forming Organs and Certain Disorders Involving the Immune Mechanism” of the ICD; hemochromatosis is also included in this chapter. Blood-clotting diseases, most of which are subsumed under CVD, have been excluded, as have other blood diseases such as bleeding and red blood disorders of the newborn and serum hepatitis.

Chart 5–1 shows the distribution of deaths in 1999 by blood disease subgroups. Chart 5–2 contains a list of blood diseases; their 9th revision ICD codes; 1999 estimates of hospital discharges, length of stay, and physician office visits for the diagnostic codes; 10th revision ICD codes for the blood diseases; and number of deaths in 1999 for those codes. Subsequent charts display morbidity and mortality for aplastic anemia and sickle cell anemia.

The annual death rates for these diseases are very small and may vary considerably from year to year. By using combined mortality over an 11-year period (1988 through 1998) to obtain average annual death rates rather than statistics for a single year, it is possible to improve data reliability for sex and race comparisons.

Blood Diseases

Chart 5–1

Blood Disease Deaths, Percent by Subgroup, U.S., 1999

Blood Diseases	Percent
Other Anemias	33.6
Coagulation Defects	19.2
Aplastic Anemia	12.2
Other Diseases of Blood and Blood-Forming Organs	11.2
Purpura and Other Hemorrhagic Conditions	10.5
Sickle Cell Anemia	5.7
Diseases of White Blood Cells	4.8
Hemochromatosis	2.7

Total Deaths = 8,733 (100%)

Chart 5–2

Number of Hospitalizations, Physician Office Visits, and Deaths for Selected Blood Diseases, U.S., 1999

Diagnostic Category	ICD/9 Codes	Hospitalizations		Physician Office Visits (1,000)	ICD/10 Codes	Deaths
		First-Listed Discharge (1,000)	Length of Stay (Days)			
Total	280–289, 275.0	368	4.8	3,365	D50–D89, E83.1	8,733
Anemias: total	280–285	232	4.9	2,233	D50–D64	4,503
Iron deficiency anemia	280	47	4.4	473	D50	118
Other deficiency anemias	281	6	4.5	284	D51–D52	99
Cooley's anemia	282.4	4	2.5	0	D56	20
Sickle cell anemia	282.6	60	5.8	122	D57.0, D57.1	501
Aplastic anemia	284	32	6.8	0	D60–D61	1,069
Other and unspecified anemias	Residual	83	3.9	1,354	Residual	2,696
Coagulation defects	286	18	5.2	19	D65–D68	1,681
Hemophilia: factor VIII	286.0	1	7.5	0	D66	78
Hemophilia: factor IX	286.1	0	1.3	0	D67	3
Other	Residual	17	5.3	19	Residual	1,600
Purpura and other hemorrhagic conditions	287	37	4.5	398	D69	920
Primary thrombocytopenia	287.3	14	5.0	115	D69.3, D69.4	353
Secondary thrombocytopenia	287.4	5	4.8	0	D69.5, D69.6	529
Other	Residual	18	4.1	283	Residual	38
Diseases of white blood cells	288	57	4.9	254	D70–D72	417
Other diseases of blood and blood-forming organs	289	24	4.2	400	D73–D89	974
Hemochromatosis	275.0	0	0	61	E83.1	238

Note: Estimates of hospitalizations and physician office visits are subject to sampling variability. Estimates of hospitalizations below 15,000 have a relative standard error of more than 16 percent. Estimates of physician office visits below a million have a relative standard error of more than 30 percent.

Compiled from references 11, 25, 28, and 32.

Anemias

Chart 5–3

Hospitalizations for Aplastic Anemia, U.S., 1982–1999

Hospitalizations for aplastic anemia nearly quadrupled by 1999 compared with 1982. The increase was due to aplastic anemia as a secondary diagnosis.^{28–29}

Year	Number (Thousands)	
	Primary	Secondary
1982	18	29
1983	20	38
1984	20	41
1985	16	45
1986	18	46
1987	19	63
1988	14	81
1989	15	73
1990	18	86
1991	24	93
1992	23	124
1993	25	119
1994	20	113
1995	23	130
1996	23	146
1997	23	134
1998	28	143
1999	32	151

Chart 5–4

Age-Adjusted Death Rates for Aplastic Anemia by Race and Sex, U.S., 1988–98

Mortality from aplastic anemia was higher in males than in females. Within sex groups, it was similar for blacks and whites.¹¹

	Deaths/100,000 Population*	
	Male	Female
Total	0.67	0.47
White	0.67	0.47
Black	0.60	0.47

* Average annual rates.

Chart 5–5

Death Rates for Aplastic Anemia by Age, Race, and Sex, U.S., 1988–98

Within race groups for all ages, aplastic anemia death rates were higher in males than in females. At younger ages, within sex groups, they were higher in blacks than in whites.¹¹

Ages	Deaths/100,000 Population*			
	White Male	White Female	Black Male	Black Female
35–44	0.09	0.07	0.23	0.13
45–54	0.17	0.15	0.31	0.22
55–64	0.50	0.40	0.76	0.49
65–74	1.59	1.14	1.56	1.25
75–84	5.11	3.32	4.27	3.00

* Average annual rates.

Chart 5–6

Hospitalization Rates for Sickle Cell Anemia, Ages <15 and 15–44, U.S., 1982–1999

Hospitalization rates for sickle cell anemia varied considerably between 1982 and 1999. Overall, however, they increased for both age groups, with rates in the older age group remaining higher than those in the younger age group.^{28–29}

Year	Hospitalizations/10,000 Population	
	Ages <15	Ages 15–44
1982	11.7	21.0
1983	12.9	20.6
1984	14.2	21.6
1985	12.8	17.8
1986	17.9	21.6
1987	16.5	21.2
1988	18.8	20.3
1989	25.0	27.8
1990	26.6	23.8
1991	21.0	24.1
1992	19.6	20.6
1993	15.9	22.7
1994	13.5	27.7
1995	22.4	26.1
1996	15.6	24.7
1997	18.9	25.6
1998	15.6	27.8
1999	16.6	25.2

Note: All discharges for this disease are assumed to be in the black population.

Chart 5–7

Age-Adjusted Death Rates for Sickle Cell Anemia by Race and Sex, U.S., 1988–98

Mortality from sickle cell anemia occurs predominantly in blacks, with males having a slightly higher death rate than females.¹¹

	Deaths/100,000 Population*	
	Male	Female
Total	0.17	0.16
White	**	**
Black	1.45	1.25

* Average annual rates.

** Rates for white males and females are less than 1/2 of 1 percent.

Chart 5–8

Death Rates for Sickle Cell Anemia by Age and Sex in Blacks, U.S., 1988–98

Sickle cell anemia mortality was relatively similar for males and for females. Death rates were especially high for individuals younger than 4 years of age and for those between ages 15 and 64 years.¹¹

Ages	Deaths/100,000 Population*	
	Black Male	Black Female
1–4	1.32	0.95
5–14	0.40	0.32
15–24	1.28	1.10
25–34	2.48	1.73
35–44	2.51	2.15
45–54	1.89	1.81
55–64	1.00	1.08
65–74	0.40	0.65
75–84	0.22	0.34

* Average annual rates.

Appendixes

International Classification of Diseases

Estimated Comparability Ratios

Definition of Terms

Abbreviations

References

Appendix A

International Classification of Diseases: Codes for Selected Diagnostic Categories (6th, 7th, 8th, 9th, and 10th Revisions)

Diagnostic Term in Chartbook	ICD/6 1949–1957	ICD/7 1958–1967	ICDA/8 1968–1978	ICD/9 1979–1998	ICD/10 1999–
Cardiovascular diseases ^a	330–334, 400–468	330–334, 400–468	390–458	390–459	I00–I99
Heart disease	400–402, 410–443	400–402, 410–443	390–398, 402, 404–429	390–398, 402, 404–429	I00–I09, I11, I13, I20–I51
Coronary heart disease ^b	420, 422	420, 422	410–413	410–414, 429.2	I20–I25
Acute myocardial infarction	*	*	410	410	I21, I22
Heart failure ^c	**	**	427.0, 427.1	428	I50
Congestive heart failure	**	**	427.0	428	I50.1
Rheumatic heart disease ^d	400–402, 410–416	400–402, 410–416	390–398	390–398	I00–I09
Cardiomyopathy	**	**	**	425	I42
Cerebrovascular diseases (stroke) ^e	330–334	330–334	430–438	430–438	I60–I69
Diseases of arteries	450–456	450–456	440–448	440–448	I70–I78
Congenital anomalies of the circulatory system ^f	**	**	746–747	745–747	Q20–Q28
Chronic obstructive pulmonary disease ^g	500–502, 527.1	500–502, 527.1	490–492, 519.3	490–492, 494–496	J40–J44
Asthma	241	241	493	493	J45–J46
Neonatal respiratory distress syndrome ^h	**	**	776.1–776.2	769	P22

a The ICD term is diseases of the circulatory system.

b The ICD/6 and ICD/7 term is arteriosclerotic heart disease; the ICDA/8, ICD/9, and ICD/10 term is ischemic heart disease.

c The ICDA/8 terms are congestive heart failure and left ventricular failure. The ICD/9 and ICD/10 term is heart failure (428) or CHF (428.0)

d The ICD/6 and ICD/7 terms are rheumatic fever and chronic rheumatic heart disease. The ICD/9 and ICD/10 terms are active rheumatic fever and chronic rheumatic heart disease.

e The ICD/6 and ICD/7 term is vascular diseases affecting the central nervous system; the ICDA/8, ICD/9, and ICD/10 term is cerebrovascular disease.

f The ICDA/8 terms are congenital anomalies of heart and other congenital anomalies of circulatory system. The ICD/9 terms are bulbus cordis anomalies and anomalies of cardiac septal closure, other congenital anomalies of heart, and other congenital anomalies of circulatory system.

g The ICD/6 and ICD/7 terms are chronic bronchitis, unqualified bronchitis, and emphysema without mention of bronchitis; the ICDA/8 terms are chronic bronchitis, unqualified bronchitis, emphysema, and chronic obstructive lung disease; the ICD/9 and ICD/10 terms are chronic bronchitis, bronchitis not specified as acute or chronic, emphysema, bronchiectasis, extrinsic allergic alveolitis, and chronic airways obstruction not elsewhere classified.

h The ICDA/8 terms are hyaline membrane disease and respiratory distress syndrome. The ICD/9 term is respiratory distress syndrome. The ICD/10 is respiratory distress of newborns.

* No code for this category exists in this ICD revision.

** No data for this category are presented in the *Chart Book* in this period.

Appendix B

Estimated Comparability Ratios for Selected Causes of Death, U.S.

Cause of Death	Codes of the International Classification of Diseases		Numbers of Deaths*		Comparability Ratio**
	ICD/10	ICD/9	ICD/10	ICD/9	
Malignant neoplasms	C00–C97	140–208	464,688	461,544	1.0068
Major cardiovascular diseases	I00–I78	390–434, 436–448	796,919	798,435	0.9981
Diseases of the heart	I00–I09, I11, I13, I20–I51	390–398, 402, 404, 410–429	615,564	624,405	0.9858
Coronary heart disease	I20–I25	410–414, 429.2	466,459	466,935	0.9990
Heart failure	I50	428	44,297	42,554	1.0410
CVD (stroke)	I60–I69	430–434, 436–438	137,264	129,640	1.0588
Diseases of arteries	I70–I78	440–448	32,133	33,706	0.9533
Influenza and pneumonia	J10–J18	480–487	50,526	72,371	0.6982
Chronic lower respiratory disease	J40–J47	490–494, 496	94,326	90,022	1.0478
COPD	J40–J44	490–492, 494, 496	90,109	85,304	1.0563
Asthma	J45–J46	493	4,217	4,718	0.8938
Neonatal RDS	P22	769	917	894	1.0257
SIDS	R95	798.0	2,575	2,485	1.0362

* From a sample of deaths in 1996.⁴

** Deaths coded to ICD/10 divided by deaths coded to ICD/9.

Appendix C

Definition of Terms

Age-adjusted death rate:	An age-adjusted rate is a summary rate for a given age range and is computed by multiplying the age-specific rates for a given diagnosis (or cause of death) by the standard population for the age range and summing those products. The standard population is the U.S. population in 2000 as it is distributed proportionately in 10-year age groups. ^{5-7, 27}
Chronic condition:	A condition is considered chronic if (1) the respondent (in a health interview) indicates it was first noticed more than 3 months before the initial date of the interview, or (2) it is a type of condition that ordinarily has a duration of more than 3 months. ¹⁵
Comparability ratio:	A comparability ratio is the number of deaths from a cause as coded by an ICD revision divided by the number of deaths from the closest similar cause as coded by the preceding ICD revision. A sample of death certificates from a chosen year is used for the calculation. The ratios measure discontinuities in mortality trends resulting from the introduction of a new ICD revision. ⁴
Hospitalization:	Hospitalization refers to hospital discharge, the formal release of a hospital inpatient. It may be the result of death or transfer to a place of residence, nursing home, or another hospital. First-listed diagnosis is the coded diagnosis identified as the primary diagnosis or the diagnosis first listed on the face sheet of the hospital medical record. Hospital refers to non-Federal, short-stay (average length of patient's stay is less than 30 days), general (e.g., medical or surgical) or children's general hospitals, with six or more beds for inpatient use. ²⁷
Incidence:	Incidence is the number of cases that had their onset during a specified period of time, usually a year. ²⁷
Infant mortality rate:	Infant mortality is the number of deaths occurring in infants younger than 1 year of age from a cause (or all causes) divided by the number of live births occurring the same year, and then expressed as the rate per 100,000 live births for that year. ²⁷
Limited in activity:	Also called chronic activity limitation, it refers to the limitation of a person's usual activity due to a chronic condition. ²⁷
Morbidity:	Morbidity refers to incidence, prevalence, hospitalizations, and physician office visits.
Prevalence:	The prevalence of a condition is the number of persons who have the condition at a given time. ²⁷
Relative standard error:	The standard error is primarily a measure of sampling error—not measurement error—that is, the variation that might occur by chance because only a sample of the population is surveyed. The relative standard error of an estimate is obtained by dividing the standard error of the estimate by the estimate itself. ²⁷
Underlying cause of death:	The underlying cause of death is the disease or injury that initiated the events leading directly to death. It is selected from the conditions entered in the cause-of-death section of the death certificate. When more than one cause or condition is entered by the physician, the underlying cause is determined by the sequence of conditions on the certificate, provisions of the ICD, and associated classification rules. ²⁷

Appendix D

Abbreviations*

AMI	acute myocardial infarction
CHD	coronary heart disease
CHF	congestive heart failure
CMS	Centers for Medicare & Medicaid Services
COPD	chronic obstructive pulmonary disease
CVD	cardiovascular diseases
ICD	International Classification of Diseases
ICDA	International Classification of Diseases, Adapted for Use in the United States
NCHS	National Center for Health Statistics
NHANES	National Health and Nutrition Examination Survey
NHIS	National Health Interview Survey
NHLBI	National Heart, Lung, and Blood Institute
RDS	respiratory distress syndrome
SIDS	sudden infant death syndrome
WHO	World Health Organization

* Country abbreviations may be found on the following page.

Appendix D

Abbreviations (continued)

AUL	Australia
CZR	Czech Republic
DEN	Denmark
FIN	Finland
GER	Germany
HUN	Hungary
JPN	Japan
KOR	Republic of Korea
NOR	Norway
NTH	Netherlands
POL	Poland
ROM	Romania
SCO	Scotland
SWE	Sweden
USA	United States of America

Appendix E

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